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REGULATING AGAINST THE RETURN ON THE INVESTMENT.

For some time the favorite topic of a good many well meaning but unenlightened ones, has been the lowering of the charge for service exacted by public service corporations no matter where their location, despite the conditions of service, and without regard to the essential reasonableness of the basis upon which the reductions required was founded. The immediate result of persistent agitation in this direction was the formation of public service commissions or boards of eminent domain in several commonwealths, and it is fortunate that the personnel of these commissions has been of such a high order that very little of the damage that could otherwise have been worked to industry has been visited upon the investors in public utilities. The rapidity with which the blow against the unrestrained liberty of corporation management was struck caught the leviathan unprepared. With the inertia of years to overcome, remedial measures were slowly taken advantage of, and the campaigns of publicity which are now the order of the day were haltingly brought into action. As a matter of fact, it seems as though the corporation monster was painted so black that it would take the most optimistic courage to foresee any future other than that of the commercial outcast.

But there were big, brainy men who had been too busy with the evolution of great corporations, spending their best efforts to bring the service up to a demand that could hardly be satiated, who saw that what the public needed was enlightenment, and who perceived also that although the public can have whatever it wants and has only to decide what this might be and then establish a decent and orderly way to get it, it was fair enough to regard the investment in public service corporations as sacred as those in any other form of industry; so that it has come to pass that in many cities there has been a toleration of increase in rates for electric light service, of the elimination of universal transfers and an increase in the unit fare for street railway service, and a lessening of the demand for restrictions and clamor for control of telephone and telegraph services.

The greatest danger which confronts the public service corporation and the people at large is the unrestrained regulation which might be imposed by legislators and councils who have not had the opportunity of becoming thoroughly conversant with the affairs at issue. The president

of a great system of interurban and street railways is not dealing in untruths or in sophistry when he points out that with the cost of material increasing, with the price of labor on the rise, with the demand for more frequent car service, and fewer car miles per unit, either the price of transportation must go up or the transfer privilege must be eliminated, or burdensome taxation be removed. The unit of our fare on our street railways in almost every instance today is the same as it was in the beginning of rail transportation, when the equipment throughout cost in the neighborhood of five per cent of what it does today and with the comfort provided today undreamed of them.

To the credit of the present commissions dealing with these affairs it may be said that they are men of the stanchest integrity and have conducted their high offices so that not the least shade of personal interest in the corporations might be indicated, and it is just in this direction where it is claimed they are making one of their greatest mistakes. In their effort to stand upright they are leaning too far back. Their fear is so great that the public might raise the clamor that they were in cahoots with the corporations that they have not in many instances been bold enough to allow the corporations to secure franchises under those conditions which would prove favorable both to the corporations and to the city in the long run, although for the moment it might look as if they were not exercising with sufficient stricture their possibilities of control.

In the annual report of the directors of the American Telephone and Telegraph Company to the stockholders, for the year just ended, Mr. Theodore N. Vail, president of the company, makes a most important and interesting commentary on this situation as follows:

"It is but natural that corporations should have some misgivings about a control of internal management by a body *without any responsibility that could be called accountability*, and without the practical knowledge or experience or information which comes from the daily dealings with questions; a control which would undertake to decide upon questions widely different, complex and far-reaching, over which expert managers of life-long study and experience are sometimes at a loss; a control over methods of business which usually are the evolution of years of practice, and are so interwoven with the fundamentals of business that they cannot be changed suddenly without great disturbance. * * * All great developments in any line of industry have been from crude and imperfect beginnings by a process of evolution, by improvement in detail the result of suggestion from association, operation, or study. The original idea upon which may be founded great development may be revolutionary, but it never springs full-fledged or perfect into the world.

"Public utility companies have obligations and are responsible both to the public and to their shareholders. It is a responsibility with accountability. *Prevent them from imposing upon the public with fictitious issues of securities, or with exactions on the public with which to pay dividends on those fictitious securities.*

"As to their internal management, operating methods, leave something to their self-interest, to their responsibility with accountability; do not impose upon them such control as might force upon them new methods, new apparatus, new ideas which have not been tried out, which have not been put through the crucible of practical experience."

It will be only when an enlightened public appreciates the enormous expenditures at which its comfort is secured and realizes that it is in effect in partnership with its public service corporations that there will be the fullest development of the utilities which science and manufacture, aided by safeguarded investment, can procure.

TELEPHONE COURTESY.

On another page we reprint from a British contemporary an interesting comment upon the proper use of the telephone, as well as a mild scolding to those who fail to appreciate the ordinary amenities of civilized life when utilizing this most important instrumentalty of business and social communication. It should be unnecessary to emphasize how much of time and effort are daily saved through the agency of the telephone, and assuming that this is recognized and appreciated, we will only dwell upon one phase of telephone use—that of courtesy and patience.

We have known of a busy man, bent upon accomplishing a seemingly impossible task, giving his private operator a string of calls that has kept his line busy for two hours. Suddenly he exclaims, "Blast it, that's the third time I've called that number and they're always busy; I don't believe it; get me the chief operator instantly." He did not realize how many times within an hour his own line had rung the busy signal to someone trying to get him. This is homely, we know, but it's true, because it's true.

No one has to wait longer for a telephone call to be attended to and a connection established than the limitations of physical effort and mechanical excellence afford in any big city today. Anyone who has stood in front of a switchboard in a central exchange has marvelled at the precision and rapidly with which the incoming calls are handled. It can be stated positively that it is the policy of the company to give the best service possible, and the operators are trained to the minute for speed and accuracy. And it can also be said that anything short of maximum speed and accuracy would immediately plunge the exchange into hopeless confusion.

We all have to wait sometimes, and we all get peevish sometimes, but just so much as we let bad temper and discourtesy block the service and increase the length of time we take in making our own calls, just so much do we hinder effective service to those who would engage us in conversation from the other end of the circuit.

IRON AND RUST.

The corrosion of iron is a phenomenon of the utmost importance to engineers and to mankind in general, and methods of preventing rust effectively for a considerable length of time will result in savings of great amount, not only in money and money values but in ways not to be measured by a mere monetary standard.

There have been offered several theories to explain the rusting of iron and steel. The one now generally accepted, however, is the electrolytic theory. This theory assumes that iron in contact with moisture first passes into solution as ferrous ions, carrying enormous charges of positive electricity, the body of the iron being left negatively charged. Oxidation of the ferrous ions into the ferric condition then causes the precipitation of rust, the insoluble hydrated form of ferric oxide. The accompanying electrolytic effects tend to set up differences of potential on the surface of the iron, with the formation of corresponding positive and negative poles and areas. The result is general corrosion and pitting, the former due to reversals of polarity and the latter to persistent polarity of the poles and areas.

The electrolytic theory can be made to explain the action of some substances, which, when in solution in water in contact with iron, tend to increase the rusting action, and of others which tend to decrease it. For instance, dilute acids and acid salts, under most conditions, stimulate corrosion, while a solution of potassium bichromate (above a certain strength) will practically stop rusting indefinitely. In fact, iron pickeled for several hours in a strong bichromate solution becomes "passive," that is, more or less resistant to rusting influences after removal from the solution. This condition of passivity, however, disappears in course of time or under certain conditions or treatments.

The oldest and best known method of protecting iron and steel from rusting is the application of paint. Paint has its advantages for this purpose; its action is positive, for a while at least, and its adaptability as a vehicle for coloring renders it useful from an artistic standpoint. But paint has a comparatively short effective life as a preventive of rust, and must therefore frequently be renewed on large structures, at great cost for material and labor. In tropical or semitropical countries, especially, the action of heat and moisture, combined with frequent sudden changes of temperature, shortens materially the life of the paint or other protective covering, and the latter must therefore be of very good quality in order to be at all effective.

A writer in a recent issue of *The Indian Textile Journal* points out that paints to resist the climate in India should be able to stand the effect of change from heat to cold, must not crack, must adhere tenaciously, and must contain no free acid. Paints made with oxidized linseed oil and a metallic pigment, even if of the best quality, have only a limited life, and become porous as they harden and grow brittle. Varnishes with a bitumen base have proved effective in India for preserving iron in exposed places, such as water pipes in salt ground. The bitumen retains its toughness longer than any oil paint, but it has only one color and that one the one which absorbs heat the most. For this reason the varnish is unsuitable for many uses, such as for coating roofs exposed to the sun.

Magnetic oxide has proved extremely serviceable for protecting iron from rust if the coating can be made without blemish. One of the best methods of producing the desired magnetic-oxide coating on iron is known as Barff's process, which at one time obtained some considerable vogue but which of late years has fallen into disuse. In this process, originated many years ago by E. S. Barff, the articles to be coated are placed in an oven and subjected to the prolonged action of superheated steam at a high temperature.

A process has recently been introduced by which the same result is obtained electrolytically without heating to such a high temperature. The iron to be coated is connected as an anode to a source of electric current, the cathode being a piece of carbon or iron, or even the cell wall. The electrolyte is simply hot water at a temperature of about 180 degrees Fahrenheit, and the current used is only strong enough to establish a circuit and produce electrochemical action. The nascent oxygen released at the iron changes the surface to magnetic oxide of iron, and the same result is said to be attained if the iron is already coated with rust. With the introduction of this electrolytic process it may be that Barff's method of protecting iron may become re-established, and if the articles so treated prove their rust-resisting properties under prolonged trial, a great field will be open for the exploitation of the new process.

Other ways of preventing corrosion of iron and steel include methods of manufacturing the metal or of subjecting it to some kind of heat or other treatment after manufacture. Perhaps it is in some one or other of these methods that the most practical solution of the problem lays. In India, for instance, iron smelted by charcoal in mud furnaces, as it is made by the natives in some of the remoter regions in the Hill States, acquires on exposure to the weather a bronze-like surface which is exceedingly resistant to rusting influences. Again, many of the armoring or case-hardening processes seem to render highly polished steel surfaces more or less immune to corrosion. Probably, with the aid of the electric furnace and exact proportions of the constituents used, someone will be able to discover a form of iron or steel which will be practically rust-proof and thus eliminate any subsequent painting or treatment.

Meeting of the Railway Signal Association.

The March meeting of the Railway Signal Association was held in the Congress Hotel, Chicago, Ill., Monday, March 14, and an interesting programme carried out.

The morning session was called to order promptly at 10 a. m. by C. E. Denny, vice-president, and after a brief opening address the reports of the outstanding committees were called for. These reports indicated a rapid progress in the various methods of signalling and also made recommendations which were voted a valuable asset to the association's proceedings.

An interesting and instructive paper by Otto Holstein, chief train despatcher, Central Railway of Peru, entitled "Lightning Protection," was then read and several interesting points brought out.

After briefly outlining the conditions to be met with in South America the paper described an arrester known as the "Argus" which is extensively used there and which gives gratifying results in the protection of telegraph and telephone lines. Another type of arrester which has given satisfactory results in South America was described. The principal parts of this arrester are of cast iron. The whole upper surface of the ground plate is furrowed and sharply ridged. The line plates are likewise furrowed and the arrester when assembled has these sharp ridges at right angles making every point of intersection a spark-gap with an air space of but one-thirty-second of an inch to break down.

The next paper to be presented was one by E. F. Marshall, of the National Carbon Company, entitled "Soda-Copper Oxide Primary Cell on Track Circuits." This paper presented a discussion of primary batteries for track circuit work, and was devoted principally to a comparison of the soda-copper oxide cell with the gravity cell.

A number of questions relative to track circuit work were considered first these including current drain, the continuous drain,, shunt drain when train is in the block, leakage, ballast in contact with rails, ties saturated with brine, and switches. Three types of soda-copper oxide cells were then described and the service and cost of each considered.

A brief discussion followed the reading of this paper, and this was followed by a paper entitled "The Portable Storage Battery in Automatic Block Signal Service," by H. M. Beck of the Electric Storage Battery Company.

Mr. Beck explained the various types of portable storage batteries now in use on different railroads and outlined the changes that have been made in these batteries up to the present time. Under the subject of charging Mr. Beck described in a comprehensive manner the methods in use and also described the several methods of distributing and collecting the batteries. Many advantages of the portable storage battery were mentioned and a number of comparative costs given.

In the discussion which followed several of the delegates mentioned the methods in use on their lines of transporting batteries to and from the signals.

"The Generation, Control and Transmission of Alternating Current for Railway Signals," by Frank Rhea and E. E. Kimball of the General Electric Company was the next paper presented.

This paper dealt fully with alternating-current systems and considered each piece of apparatus entering into such a system. This included a description of power stations, prime movers, generators, converters, transformers, switchboards, transmission lines, lightning protectors, and the features of the different types of alternating current systems.

After a brief discussion the meeting adjourned to attend bodily the Exhibition of Railway Appliances at the Coliseum, Chicago.

Electric Storage Battery Company Acquires Westinghouse Patents.

The Electric Storage Battery Company of Philadelphia has acquired all the patents and rights of the Westinghouse Storage Battery Company. The latter owned all the rights of the General Storage Battery Company, and the storage battery interests and patents of the Westinghouse Machine Company.

From this time on the Electric Storage Battery Company will have the sole right to manufacture Westinghouse batteries.

Chicago Electric Club.

Among the topics receiving widespread attention in Chicago, is that of a suitable harbor, it being generally known that the shipping facilities, or rather lack of shipping facilities are not in any way commensurate with its remarkable growth in other ways, nor do they compare favorably with the facilities of other lake towns.

John W. Mabbs, chief engineer, Board of Trade, Chicago, having given considerable study to the proposition has worked out a harbor plan which he interestingly explained at the regular meeting of the Chicago Electric Club on Wednesday, March 9.

The plan embodies the building of a sea wall about two miles off shore, and just inside of the water works cribs, to extend from Evanston to the Calumet River, approximately twenty-two miles. This wall is to be constructed of crushed stone to be gathered from the banks of the Chicago drainage canal and be transported on water to the desired location. The general dimensions of the wall are to be 135 feet at the base and taper to about twenty feet at the top and there are to be no openings except at the two extremities.

The wharves to be built inside of this enclosure are provided with hydraulic apparatus for the loading and unloading of cargoes.

Taking advantage of the proposed subway construction plans, Mr. Mabbs' plan provides for connection from the wharves to the subway which would mean direct connection with all railroad terminals.

In conclusion the speaker said that in addition to providing an efficient harbor his plans provide for the protection of the water supply of Chicago and in addition afford a safe harbor for pleasure craft.

In the discussion which followed N. B. Parsons asked what provisions had been made for lumber storage. Mr. Mabbs said that the lumber shipping on water had decreased greatly and by providing connections with the subway lumber could be easily handled.

In reply to a question as to the estimated cost of constructing the wall Mr. Mabbs said it would be about $6,000,000.

J. M. Wakeman, of New York, was present and was called upon for a few remarks.

Union Noble Bethell.

One of the most charming and impressive gentlemen in the public eye, and way up at the top in public service matters, is Union Noble Bethell, whose photograph is published on this page.

Mr. Bethell was recently elected president of the New York Telephone Company. He is also president of the Bell Telephone Company of Pennsylvania, the Central District and Printing Telegraph Company, the Chesapeake & Potomac Telephone Company, the Delaware & Atlantic Telephone Company, and the Diamond City Telephone Company. The operations of these companies cover a territory of about 124,000 square miles. The telephone plant in this territory represents an investment of about $175,000,000, and the companies supply telephone service to more than 1,150,000 telephones and furnish employment to more than 31,000 employees. Mr. Bethell is also vice-president of the American Telephone and Telegraph Company.

Mr. Bethell has been in the telephone field since 1888, although he is comparatively a young man, being only fifty years old. He was born in Indiana, and graduated from Hanover College in 1879. Later he went to Washington, where he was employed in the Pension Bureau. During his stay in Washington he attended the Columbia Law School, from which he graduated, being admitted to the bar shortly afterward.

Mr. Bethell went to New York and became interested in the telephone business, entering actively into telephone work at a period when, compared with the remarkable strides which have been made today, the industry was in its struggling infancy. His rise was rapid, and shortly after he became identified with the New York & New Jersey Telephone Company. He was made secretary.

In 1893, due to his conspicuous ability, he was made general manager of the New York company, and shortly afterwards was made vice-president.

With his election to the presidency of the New York Telephone Company, Mr. Bethell becomes the head of the largest group of operating telephone companies in the Bell system.

UNION NOBLE BETHELL,
Recently Elected President of the New York Telephone Company.

Wisconsin Rate Decision.

The recent decision of the Wisconsin railroad commission fixing the rates in Madison for electric light and power and gas furnished by the Madison Gas and Electric company is important in that it sets a precedent for rate making as applied to all other public service utilities of the state.

The commission decided that the company is entitled to a reasonable return in the way of interest and profit on a valuation of about $535,000 for the electric plant and of about $412,000 for the gas plant allowing the company seven and one-half to eight per cent earnings on the valuation.

In the matter of valuations, the commission did not allow the company a cent on intangible values, although it claimed such values amounted to about $300,000. The company's total claim of valuation was $1,300,000, which the railroad commission reduced to $947,000.

The commission held that nothing other than the cost of reproduction of the plant new should be allowed as the basis of rates, the company holding that several other and additional values should be allowed. The claims of the company for a fifteen per cent allowance, or $143,000, on account of the fact that the plant was built piecemeal instead of in one large continuous operation was ignored by the commission, and a claim of an allowance of not less than $100,000 as a working capital was reduced to $50,000. The claim of an allowance of eighteen per cent over invetory valuation to represent cost of interest, contingencies, superintendence and engineering during construction was reduced to twelve per cent.

The commission stated that the conditions of electric and gas service were found to be satisfactory and to compare favorably with conditions found in other cities of the state. The present rates of the company were denounced as unwarranted under the circumstances, the commission stating that they are not equitably adjusted between different classes of consumers. The general reduction of the cost of electricity amounts to two cents per kilowatt-hour and of gas to ten cents per 1,000 cubic feet. The decision will probably be appealed from.

Long-Distance Wireless.

A remarkably long wireless transmission was recently recorded by the steamship Tennessee, five days out from Honolulu, which succeeded in catching a message from Table Bluff on the coast of California. The message was a weather report, which was afterward verified by the Navy Department. The distance of transmission was 4,580 miles.

Pittsburg Section of the A. I. E. E.

The Pittsburg Section of the American Institute of Electrical Engineers held its regular meeting at the Carnegie Institute March 8, 1910. B. P. Rowe of the Westinghouse Electric & Manufacturing Company presented "Some Practical Hints for Securing a Satisfactory Switchboard." Mr. Rowe discussed the question from the purchasers' standpoint, showing that the question of what apparatus is needed and its type is the first consideration and after that its arrangement and assembly should follow. He spoke in favor of keeping as much apparatus off the back of the switchboard as possible.

H. L. Fullerton and H. N. Mueller of the Allegheny County Light Company offered some points from their own experience, and J. S. Jenks of the West Penn Railways Company referred to the difficulty in building an ideal switchboard in an old structure. One of the particular points of discussion was distant control by bell crank and by transmission rope.

S. Q. Hayes of the Westinghouse Electric & Manufacturing Company elaborated at some length on some of the points brought out in the paper.

Waterpower Regulation in New York.

Edwin A. Merritt, Jr., Republican leader of the Assembly, has issued a statement in answer to certain criticisms concerning the concurrent resolution introduced by him proposing an amendment to the constitution with respect to the forest preserve. The purpose of the resolution is to legalize the storage of water, the development of water power and the transmission of electric current, under State control. He wants the constitution amended so that a limited amount of the State land, not exceeding three per cent of the whole, may be used for the making of water power, under State control but not State ownership. Nearly a quarter of the State area, he says, is comprised in the reserves. If all possible water sites were utilized they would amount to less than four per cent of the whole and most of this is now swamp which it would be better from all points of view to have covered with water.

"The State has no sites within the Adirondack preserves of which water powers to develop large units can be established," says Assemblyman Merritt. "The places where the rivers fall down the hills are outside the Adirondack park. Those sites afford opportunity for the development of business which will employ capital and labor and pay State and local taxes. The State can store the waters of spring and fall which are renewed with absolute certainty year after year and, holding the overplus of spring and autumn floods, regulate the flow of the streams to produce the highest practicable minimum flow of cubic feet of water per second. I want the State to be reimbursed for any advancement of money or furnishing of credit, and I want the people who receive that benefit to pay those expenses. I want them to have the opportunity to exert to the highest degree their wisdom in the investment of capital, their ability in the managing of productive energy. I want them to turn all the wheels and light all the lights and move all the cars that the great commercial interests of the State require, until the last water horsepower of energy has been employed."

Five-Cent Fare Case Dismissed.

The New York Public Service Commission has decided that the Brooklyn Rapid Transit Company can maintain its ten-cent fare to Coney Island.

The case has been under consideration for two years and was on complaint of Jonas Monheimer and Scott McReynolds. The order of the commission dismissed the complaint.

Commissioners McCarroll, Bassett and Eustis voted for the order. Commissioner Maltbie voted against the order, as did Chairman Willcox, the latter making the following statement:

"I am in favor of dismissing the complaint so far as the lines other than the Brighton Beach line operated by the Brooklyn Union Elevated Railroad Company are concerned, and as the order affects that line I wish to be recorded against it."

Compulsory Wireless.

Senator Frye has introduced in the senate a bill to require the installation of apparatus and operators for radio-communication on certain ocean steamers. The bill provides that it shall be unlawful for any ocean-going steamer of the United States, or of any foreign country, carrying passengers and carrying fifty or more persons, including passengers and crew, to leave or attempt to leave any port of the United States unless such steamer shall be equipped with an efficient apparatus for radio-communication, in good working order, in charge of a person skilled in the use of such apparatus, which apparatus shall be capable of transmitting and receiving messages over a distance of at least 100 miles, night or day.

A fine of not less than $1,000 and not more than $5,000 is to be imposed upon offenders. The bill was referred to the Committee on Commerce.

Denies Westinghouse-General Electric Amalgamation.

Despatches from Pittsburg published in New York and Chicago daily papers announced plans of a $150,000,000 corporation, backed by Kuhn, Loeb & Company of New York, forming an amalgamation of the General Electric and Westinghouse Electric and Manufacturing companies. Inquiries at New York and Pittsburg have been met with a denial of such plans by Robert Mather, chairman of the board of directors of the Westinghouse Company.

Receivership Ended.

In the Superior Court at Hartford, Ct., the receivership of the Electric Vehicle Company was wound up. Judge Wheeler accepted the final report of Henry W. Nuckols of Hartford, and Halsey M. Barrett, of Jersey City, as receivers, approved the sale of the assets and discharged the receivers.

The receivership was considered successful. The business has been reorganized and taken over by the Columbia Motor Company, which is now doing a large business.

Western Union Buys American District Telegraph Company of New Jersey.

President Robert C. Clowry of the Western Union Telegraph Company announces that his company has purchased what amounts to a controlling interest in the stock of the American District Telegraph Company of New Jersey, which is the holding company for about forty American District Telegraph organizations covering with messenger and signal telegraph service practically every city in the country outside of New York.

ELECTRICITY IN A MODERN LAUNDRY.

AN UP-TO-DATE INSTALLATION IN SAN FRANCISCO.

The following interesting description of an electrically equipped laundry in San Francisco is reprinted from a recent issue of the *Journal of Electricity, Power and Gas*, by the courtesy of the editor of that paper, to whom thanks are also due for the loan of the photographs from which the accompanying illustrations were made:

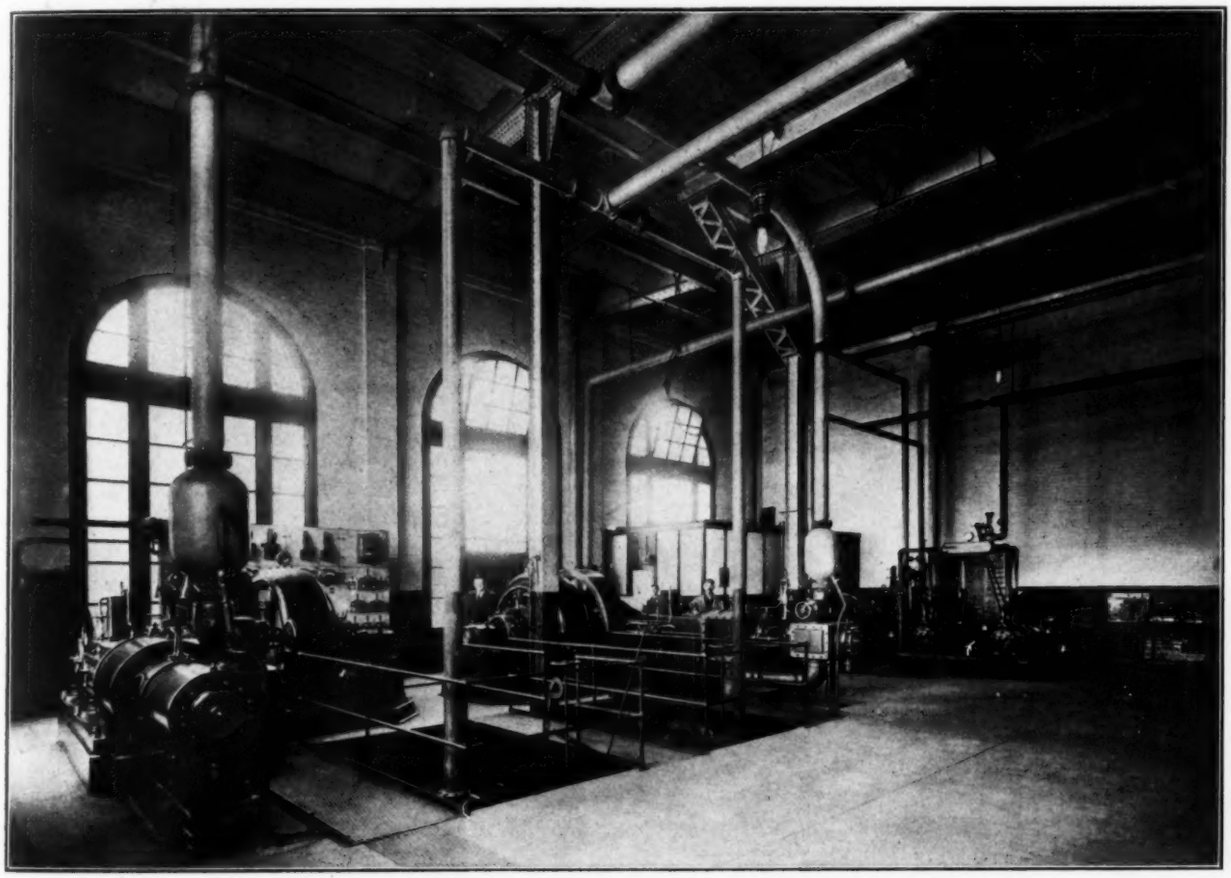
housed in two brick buildings separated by an alley, under which a tunnel carries the electric conduits, and steam and water pipes, both hot and cold water.

The most noteworthy feature of the plant is its independence from all outside sources of power and water. There is nothing more essential to a laundry than water. This is obtained in abundance from five wells which have been sunk to a depth of 200 feet. Three of these wells are equipped with air-lift and two, with steam pumps, one of the latter being a double-actig pump, especially designed and patented by the chief engineer of the plant, J. G. Dorward. These pumps deliver the water to a sump from which a motor-driven centrifugal pump elevates it sixty-five feet to the top of the water softener. This is of the Kennicott type with an hourly capacity of 30,000 gallons.

The water from the wells is hard, inasmuch as it contains about twenty-five grains of carbonate of magnesia to the gallon. This is precipitated by adding a solution of soda ash and lime as the water enters the top of the softener. This solution is steamsiphoned from a lower mixing vat to a receiver from which it is automatically supplied in any desired proportion to the entering hard water. An ingenious electric contact and solenoid-operated counter in the chief engineer's office gives convenient record of its operation.

This Kennicott softener is the largest on the Pacific Coast, holding 125,000 gallons of water, being eighteen feet in diameter and sixty-five feet high. By its means ninety per cent of the hardness of the water is removed, which makes a great saving in the wear and tear on the clothes, and also in the soap bill. The softener also supplies water to the boilers, although the chief reason for their remarkable freedom from scale is attributed to the fact that the plant is run condensing. The cooling water from the condensers flows to a tank which supplies the laundry, its heat being further maintained by the exhaust from the air compressor.

The hardening ingredients in water destroy the effect of large quantities



POWER PLANT OF THE METROPOLITAN LAUNDRY, SAN FRANCISCO, CAL.

There are but few labors to which electric power can be better applied than those of the laundry. As an example attention is here to be directed to the equipment of the Metropolitan Laundry at Eighth and Harrison Streets, San Francisco, which is said to be the largest and most up-to-date in the United States. This installation consists essentially of two parts, the power plant and the laundry proper. Taken together they occupy nearly an acre of ground, and are substantially

of soap by uniting with it and forming an insoluble compound known as "soap curd." Each degree of hardness per gallon of water destroys approximately one and one-half pounds per 1000 gallons of water before any detergent action is produced. In other words, the hard water is softened by the use of soap before any beneficial action is obtained from the soap. To overcome this wasteful result laundry men are forced to add sodas to the water which precipitate the hardening ingredients upon the goods, making them very harsh. These sodas also rapidly destroy the fiber. The soap curds, deposited in the fiber of the goods, being insoluble cannot be removed by subsequent rinsing. These curds cause white goods to become a dirty gray and are decomposed by the hot iron, causing greasy appearing, yellow stains or streaks most frequently noticed at the seams. The harshness, due to these curds and the hardening ingredients precipitated by the washing sodas, is especially noticed in woolen and flannel goods.

The steam plant supplies power for pumping 175,000 gallons daily, and also furnishes electric current for heating, light and power in the laundry. The boiler equipment consists of three Heine safety water-tube boilers made by the Risdon Iron and Locomotive Works, of San Francisco, each of 277 rated horsepower. There is also a low-pressure Risdon boiler used as a water heater. The boilers are oil-fired and equipped with McLain oil burners, the duplex oil set being a four and one-half by two and three-quarters by four inch Worthington.

The generating plant includes four Westinghouse direct-current dynamos arranged for three-wire service. The two main generators are 150-kilowatt, 220-volt machines direct-connected to tandem-compound Ball engines, eleven by nineteen by twenty. The hot-well, feed-water pumps and condensers are placed in a pit between the two engines. All condensation from the laundry is returned to the power plant and by this means fully seventy-five per cent of the water is saved. In addition, there are two seventeen and one-half-kilowatt, direct-current Westinghouse generators driven by Ohmen engines, which are used to even up the unbalanced load on the large generators and to supply current for lighting and operating the different departments when necessary to run overtime.

By means of the three-wire system, current for lighting is supplied at 110 volts and for power at 220 volts. The Westinghouse three-wire system, as here installed, is so arranged that the current is supplied by one machine, so in the event of light load it is not necessary to run the two generators. The generators differ from the standard single-voltage, direct-curent machines by the addition of auto-transformers and an arrangement of the armature-lead connections somewhat like those on the alternating-current side of the armatures of rotary converters, the armature lead of three-wire dynamos being connected to collector rings placed on the shaft. The connections from the armature to the collector rings are two-phase, across which a pair of auto-transformers or balancing coils are connected. These balancing coils consist of a single winding upon a laminated iron core. The assembled coils are placed in iron cases filled with oil. The middle points of the balancing coils are interconnected and from this connection the neutral lead of the three-wire system is led. It is obvious that the pressure between the neutral wire and either generator terminal is one-half of the 220-volt generator pressure. In this installation the coils have been placed in the wall, close to the switchboard, which arrangement has proved eminently satisfactory.

The switchboard consists of four panels, one for the two 150-kilowatt gen-

MOTOR-DRIVEN FLATWORK IRONERS.

ELECTRIC HAND IRONS.

MOTOR-DRIVEN EXTRACTORS.

erators; one for the two seventeen-and-one-half-kilowatt machines; one for the motors in the power plant, and one for the power and lighting circuit in the laundry.

As already mentioned, a thirty-inch centrifugal pump, single-stage, built by the Risdon Iron Works, is driven by a twenty-horsepower motor to pump water from the sump to the top of the softener. There is also a steam-driven air compressor installed by the Compressed Air Machinery Company, of San Francisco, supplying air for the air-lift pumps and to various machines in the laundry.

The lighting circuit supplies current not only for the incandescent and arc lamps with which the plant is equipped, but also for the electric irons. These are the standard irons manufactured by the Pacific Electric Heating Company, of Ontario, Cal., and take from six to ten amperes at 110 volts. As there are fifty of these hand irons the large amount of current required is readily appreciated. But considering the great amount of time that they save and the excellence of the work they do, the cost is well justified.

The power circuits furnish current for electric drive of all the machines in the laundry, including washers, extractors, mangles and ventilating fans. These motors aggregate sixty-two in number and vary in size from a quarter to twenty horsepower. They are all made by the General Electric Company and where not direct-connected, are equipped with the Morse silent chain.

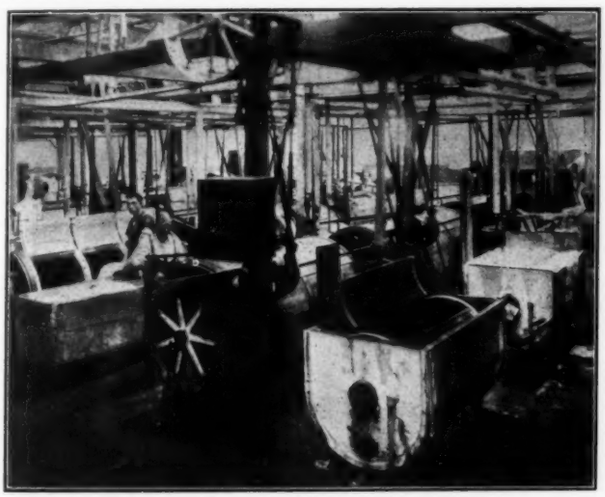
Upon delivery from the wagon, all pieces are first marked for identification, either by hand or more recently by a motor-driven marking machine, manufactured by the National Marking Machine Company. This machine resembles a linotype without the matrix-casting mechanism. The pieces are then segregated as to kind, for each class, such as blankets, flannels, toweling and starched pieces, requires different treatment.

There are 110 washers arranged in ten clusters of eleven each. Each cluster is driven by a fifteen-horsepower motor. Hot and cold water is supplied from the power plant and soap is made on the premises.

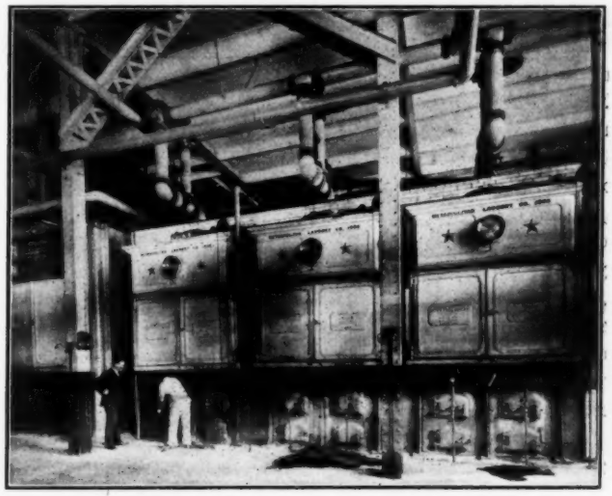
The extractors, or wringers, are forty in number, being arranged in ten lines of four each. Each set of four twenty-eight-inch extractors is driven by a seven-and-one-half-horsepower motor from overhead line shafting.

There are eight Hagen mangles, two being four-roll and the others six-roll machines. Each is operated by a three-horsepower variable-speed General Electric motor with rheostat control.

There are five conveyor dryer houses, each operated by a three-quarter-horsepower motor. These are heated by steam coils and during the course of one-half hour's travel through them, the finer pieces are completely dried. There are also three lines of shirt machines, each driven by five-horsepower motors. All the dryer houses are supplied with steam at 120 pounds pressure, the power plant being operated under 160 pounds pressure. The steam line to the laundry is set with a four-inch safety valve connected to the six-inch line, so as to protect the laundry machinery, in case high-pressure steam is accidentally introduced when the boilers are changed. The flat work irons are all steam heated. This condensation, as before mentioned, is from the steam traps returned to the power plant. In the collar department, the collar tables, ironers and dampeners are all operated by individual motors, connected to the machine by Morse chains. In the shirt department there are eighteen body ironers, gas heated, one three-horsepower motor operating six machines. This plant is under the management of F. F. Connor.



MOTOR-DRIVEN WASHING MACHINES.



BOILERS IN THE METROPOLITAN LAUNDRY.

A Long Trolley Trip.

From Portland, Me., to St. Louis, Mo., by trolley is a trip which has been made recently by Willard S. Long, a wealthy resident of Portland. Mr. Long passed through Indianapolis, March 3 and said the trip was a pleasant jaunt. The entire distance was covered by trolley with the exception of two breaks—one of forty-six miles in southern New York and the other forty miles between Terre Haute and Effingham, Ill., where it was necessary to take passage on steam cars.

In a general way Mr. Long traveled over routes parallel to the great steam trunk lines, having made the trip from Portland to Boston, New York, Philadelphia, Allentown, Hazelton, Carbondale, thence through southern New York along northern Ohio, over the Indiana Union Traction line to Indianapolis & Eastern to Terre Haute. He said he would return via the Illinois Traction Company's line and through northern Indiana. S.

Electric Mine Hoisting; Papers at the American Institute of Electrical Engineers.

The two hundred and forty-fifth meeting of the American Institute of Electrical Engineers was held at the Engineering Societies Building, 29 West Thirty-ninth Street, New York city, on Friday evening, March 11 last. President Stillwell called the meeting to order at 8:20 p. m.

Secretary Pope made some preliminary announcements which included a brief report of the Directors' meeting of the same afternoon.

At this meeting new associates to the number of 101 were elected.

The following associates were transferred to the grade of member: Frank M. Tait, Dayton, Ohio; Louis C. Marburg, Milwaukee, Wis.; Robert B. Williamson, Milwaukee Wis.; Thomas Commerford Martin, New York city.

The following ticket was prepared for election of officers, for the election which will be reported on at the annual meeting on May 17:

For president, Dugald C. Jackson, Boston; for vice-presidents, P. H. Thomas, New York; H. W. Buck, New York; Morgan Brooks, Urbana, Ill.; for managers, H. H. Barnes, Jr., New York; C. E. Scribner, New York; W. S. Rugg, New York; R. G. Black, Toronto; for treasurer, George A. Hamilton, New York; for secretary, Ralph W. Pope, New York.

Following the secretary's report, President Stillwell announced that the meeting was under the auspices of the Industrial Power Committee, of which D. B. Rushmore is chairman. Two papers were down on the programme for presentation, both of which were presented in abstract to economize time.

The first paper entitled "Electric Mine Hoists" by D. B. Rushmore and Karl A. Pauly, was presented in part by the authors successively, and was followed by some lantern slides which were described by Mr. Pauly.

In this paper the authors, discussing the choice of system for mine hoisting, pointed out the advantages of electric driving, whereby the most economical operation could be obtained by grouping a number of mines and supplying them from a single power station. Other advantages accruing from the use of electricity were the ease of making extensions to the development, the safety devices which have been developed which prevent overwinding and which also limit the ecceleraton, and finally the fuel economy which resulted from the return of power to the system in braking and in lowering unbalanced. Motor characteristics were next discussed, followed by an inquiry into the six principal types of mine hoists, as follows: reel hoist, cylindrical drum hoist, conical drum hoist, cylindro-conical drum hoist, Kolpe disk hoist, and Whiting hoist. Various systems of electric hoisting were then examined, with especial reference to four systems illustrated with the aid of diagrams and the results of which were analyzed by means of curves and figures. The authors summed up the advantages of electric hoisting as follows: (1) Greater economy resulting from the centralization of the development of power in a large central electric station, favorably located for the economical development of power, and from a reduction in the operating force, from the increased life of the rope and the greater life of the brakes. (2) Greater safety in operation. (3) Especially, adaptation for underground installations. (4) The fact that it permits of the utilization of water power which is frequently available in mining districts.

The second paper programmed, "Large Electric Hoisting Plants," was presented by the author, Wilfred Sykes. This paper described some methods used by the author for the determination of load diagrams and also the characteristics of balancing systems and their economy. The former was discussed mathematically, and the latter chiefly descriptively, with the aid of diagrams. The author, in conclusion, drew attention to some of the advantages of electric hoists from an operating standpoint. The most important is the complete control afforded over the hoist when running, enabling the operator to work much quicker and with great certainty. The ease with which the braking can be taken care of electrically makes it possible to manipulate the hoist with the greatest precision, the mechanical brakes being used only for holding the load. Under certain circumstances energy may be returned to the system by the hoist, which reduces the power consumption, but the main point is that it obviates the excessive wear on the brakes which would otherwise have to absorb this energy. Electric hoists may be fitted with devices for automatically reducing the speed and preventing over winding, which are absolutely certain in their action, and on this account the authorities in Germany allow men to be hoisted at a speed up to 2,000 feet per minute, whereas, with steam hoists the limit is fixed at 1,000 feet per minute. An electric motor is a very simple machine and requires considerably less attention than a steam engine needs, and the splendid service which it gives under the most severe conditions disposes of any question as to its reliability.

During the reading of his paper, referring to a comparison made in the previous paper between electric hoists and air-driven hoists, Mr. Sykes noted a recent case in which it was necessary to make some guarantees. In the mine in question, which is at present operating at a depth of 800 feet, the power input (the air compressor being used for other purposes), works out at 4.5 kilowatt-hours per ton hoisted, and the guarantee given for the plant was 2.2 kilowatt-hours per ton for 1,500 feet.

R. R. Seeber followed with an abstract of a paper on tests, made last February, or an actual operation at two mines of which he has charge. Mr. Seeber prefaced his remarks by stating that, with mining men, reliability is the question of chief importance, and not the saving of a few pounds of coal. A description of the hoisting equipment (on the Ilgner system with some minor variations therefrom) followed. A detained account of the tests was then given, and Mr. Seeber showed that the economy of the electric over the steam hoist worked out at twenty-five per cent, on a comparison of the rock to coal ratios. The greatest disadvantage of the Ilgner system, Mr. Seeber pointed out, is the constant loss in windage and bearing friction of the motor-generator set. This loss can be reduced materially by casing the flywheel. The use of the electric hoist enabled Mr. Seeber's company to dispense with two boiler plants and their attendants.

At the conclusion of his paper Mr. Seeber described some illustrations on the screen.

President Stillwell, in closing the meeting, thanked the authors, on behalf of the assembly, for their papers, and requested those who had prepared discussions to forward the same to the

secretary in writing. Mr. Stillwell, commenting briefly on the papers which had just been presented, recommended that data similar to those compiled in the matter of delays on electrically operated roads, be prepared in regard to electric hoisting. He thought that such material would enable engineers to meet the contention that although electricity in hoisting was undoubtedly economical, it was of doubtful reliability.

New York City Railway Suit.

By an order signed last week by Judge Lacombe, of the United States Circuit Court, William W. Ladd, receiver for the New York City Railway Company, is granted an extension of time until April 4 in which to take testimony in the suit against the Interborough-Metropolitan Company, L. L. Benediet and Company, Henry Clews and Company, H. K. Burras and Company, Hallgarten and Company, Marshall, Spader and Company, the Morton Trust Company, several other brokerage houses and about seventy other defendants.

The suit is for the recovery of $7,348,000 due as the unpaid portion of the price of stock of the Metropolitan Securities Company held by the defendants, and is the outcome of Receiver Ladd having failed to collect $5,271,582, part of a judgment against the Metropolitan Securities Company.

A Successful N. E. L. A. Meeting At Pittsburg.

A very interesting and successful meeting, brought about through the co-operation of the officers of the Westinghouse Electric and Manufacturing Company, together with those of the National Electric Light Association, was held in Pittsburg, Pa., March 2. A large number of central-station men were present, many of whom were not affiliated with the association prior to this meeting.

That the meetings were productive of results is evidenced by the report of the Executive Secretary, showing 100 new Class E members and fifteen Class A members.

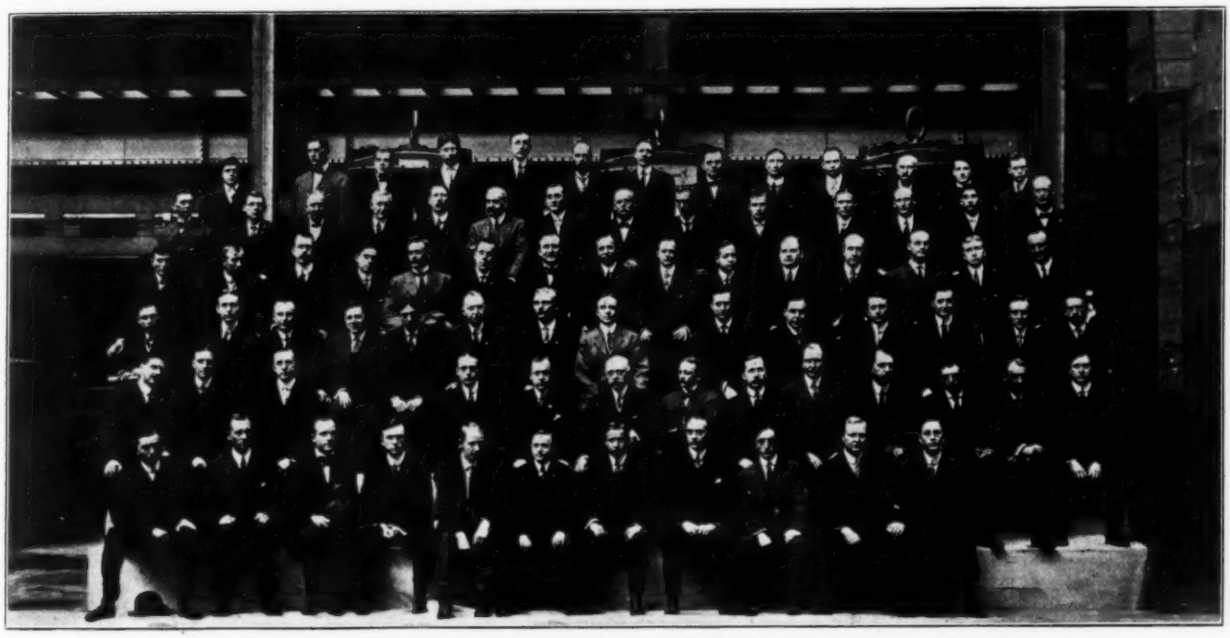
The first meeting was held in the office building of the Westinghouse works at East Pittsburg, and following a brief address of welcome, by E. M. Herr, first vice-president, interesting and instructive talks along the line of central-station progress were given.

Following these talks, the delegation began a tour of inspection through the Westinghouse works, inspecting particularly such apparatus as plays an important part in the building up of central-station loads. The accompanying photograph was taken in one of the aisles of the plant at the conclusion of the inspection tour.

An afternoon meeting was held in the Hotel Schenley, the delegates being transported from East Pittsburg in special cars. Frank W. Frueauff, president of the National Electric Light Association, presided. The benefits to be derived by membership in the association was covered in a talk by Henry L. Doherty, past president of the association. T. C. Martin, executive secretary, spoke of the growth of the association and the enlargement of the work, and H. H. Scott, chairman of the membership committee, outlined how the work that has been accomplished was brought about, and the results that had been realized.

In the evening an elaborate dinner was provided by the Westinghouse Company at which the following speakers were heard: L. A. Osborne, Frank W. Frueauff, L. Gaskill, T. C. Martin, J. McCarthy, Henry L. Doherty, A. R. Granger, H. H. Scott and E. M. Herr.

A feature of this dinner was the utilization of Westinghouse electric disc stoves, at each cover, the stoves later being presented to the guests as souvenirs of a profitable "get together" day.



MEMBERS AND GUESTS AT THE PITTSBURGH MEETING OF THE N. E. L. A., MARCH 2.

Electric Show for Denver.

Preliminary plans have been made for an electric show, to be held this fall at Denver, by the Colorado Electric Club. It is said that the show will be the largest exhibition of its kind ever held in the West, and plans are made to have it on the same sale as the New York and Chicago shows.

THE EFFECTS AND USE OF RADIUM.[1]

BY DR. DAWSON TURNER.[2]

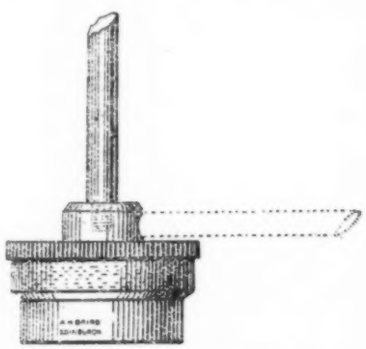
In 1903 I purchased twenty milligrammes of radium bromide, in January, 1904, ten milligrammes, while in the electrical department of the Royal Infirmary, Edinburgh, I have had charge of fifteen milligrammes.

All the specimens were in sealed glass tubes except the one of ten milligrammes, which was in an ebonite case with a thin mica window. This specimen also was quite pure with an activity according to the Curie method of measurement of 2,000,000. To contain this latter specimen I have recently had a small aluminum box made by Baird, Lothian Street, Edinburgh, with a lid which screws on tightly enough to make a watertight joint. The bottom of this box is only one-fifth of a millimetre thick, so that it is practically quite transparent to the beta and gamma rays. There is a hole in the lid of the box into which an aluminum rod can be screwed so as to facilitate applying the specimen to the interior of the mouth or other cavity, as shown in the accompanying illustration.

Last April I went to Paris to study the methods at the Radium Institute and saw their *toiles radiferes* and other applicators, but I have made no use of these myself. The amount of active salt is spread out into so thin a layer that I doubt their radiating efficiency except for the most superficial condition, and if any screen, such as even a thin piece of india rubber, be used to prevent their being damaged by an ulcerating surface the rays that would penetrate the screen would be comparatively few in number. I have also an oesophageal applicator made by Martindale. With the appartus I have used I have been practically limited to the different varieties of beta rays and gamma rays. Alpha rays can be obtained from the *toiles radiferes* and plasters provided no screen at all be used, but these rays would be stopped by the first layer of the tissues and would therefore only influence that layer.

Radium rays appear to have two chief actions: (1) A specific action on certain pathological conditions such as rodent ulcers, cancerous nodules, angiomas, keloids, cicatrices, and fibrous contractions; (2) an action producing inflammation and destruction somewhat similar to that produced by caustics and burns. Sometimes the one action and sometimes the other may be used, and often both are combined.

The curative action of radium on a rodent ulcer is an example of its specific action. After a sufficient exposure the floor of the ulcer will be observed gradually to fill up, the raised edges to subside, the surface to contract, until finally the part will be covered with fresh rather transparent skin. As a rule no pain at all will be felt, and there may be but little inflammation, but the part may dry up under a scab. This is an ideal treatment and an example of the *cito, tuto, et jucunde.*



RADIUM APPLICATOR.

If radium be applied in a sufficient dose to the healthy skin there will be observed in the course of a few hours to some days a red spot which will become slightly raised and a little tender. Over this a scab may form resembling, as Wickham has pointed out, an impetigo crust. This may persist for a time or be replaced by another, but the final result will be good. I have not observed any tendency to form the obstinate and painful X-ray sore.

The dose of radium ought to be measured by the product of the strength of the preparation and the length of the exposure—what would be termed electrically the ampere-hours, but these quantities would be modified by the presence of screens.

The effect of the screens is to cut off the less penetrating rays, and so to protect the skin or superficial tissues. For only those rays which are absorbed by the skin can affect it. All the rays of radium can be cut off by a sufficient screen except the gamma rays, and the latter are few in number. If a superficial condition is to be attacked use no screen and give a comparatively short exposure. The alpha rays now predominate; they are very powerful; but feebly penetrating.

If a subcutaneous condition is to be treated use a screen of aluminum of about one-third to half a millimetre in thickness, or a lead one of about one-tenth of a millimetre, and give a longer exposure. The thicker the screen the less the skin will be affected, but the longer the exposure. Only the beta and gamma rays will now be of use, for a thin sheet of note paper is sufficient to stop all alpha rays. If the disease be still deeper use a lead screen, one-fifth on one millimetre in thickness and give a prolonged exposure. Only the hard beta and gamma rays will get through, and they are few in number. A prolonged exposure is therefore necessary.

As a rule, no after dressings are necessary; leave the part alone. Bad results are atrophies and telangietectases; they may be the result of an overdose.

Among the conditions in which radium may be of service are: rodent ulcer, angiomas, keloids, cicatrices and fibrous contractions, warty growths, simple ulcers, malignant growths, pruritus.

1 Abstract of an address delivered before the Edinburgh (Scotland) Medico-Chirurgical Society, December 1, 1909.—From the London (Eng.) *Lancet.*

2 Medical Electrician to the Royal Infirmary, Edinburgh.

Electrical Equipment of the New Cunarder.

Electricity on the new Cunard steamer *Franconia,* now being constructed on the River Tyne in England, will be generated by three compound engines and dynamos, each of 130 kilowatts. The electrical installation, which is being intrusted to W. C. Martin and Company, of Glasgow, Scotland, will comprise about 3,000 electric lights, in addition to electric bells, fans, radiators, motors, telephones, clocks, searchlight, and other appliances.

Brooklyn Rapid Transit Franchise Taxes.

The Brooklyn Rapid Transit Company paid to the Bureau of Assessment and Arrears $700,000 on the claims for unpaid franchise taxes. The Coney Island & Brooklyn Railroad Company has paid in $150,000. The payments were made with the understanding that the balances should not be pressed until the courts have passed on the cases now pending.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY.

ANNUAL REPORT OF THE DIRECTORS TO THE STOCKHOLDERS FOR THE YEAR ENDING DECEMBER 31, 1909.

The annual report of the directors to the stockholders of the American Telephone and Telegraph Company, for the year ending December 31, 1909, has been presented by President Theodore N. Vail, under date of March 8.

At the end of the year the number of stations which constituted the Bell system in the United States, was 5,142,692, an increase of 778,063. 1,508,790 of these were operated by local, cooperative and rural independent companies or associations having sub-license or connection contracts, so-called connecting companies.

The total mileage of wire in use for exchange and toll service was 10,480,026 miles, of which 649,308 were added during the year. These figures do not include the mileage of wire operated by connecting companies.

Including the traffic over the long-distance lines, but not including connecting companies, the daily average of toll connections was about 517,000 and of exchange connections about 19,925,000, as against corresponding figures in 1908 of 463,000 and 18,500,000; the total daily average for 1909 reaching 20,442,000, or at the rate of about 6,582,300,000 per year.

PLANT ADDITIONS.

The amount added to plant and real estate by all the companies, excluding connecting companies, constituting the system in the United States during the year 1909 was:

For exchanges	$20,958,700
For toll lines	6,316,100
For land and buildings	1,425,300
	$28,700,100

During the year $44,838,900 was applied out of revenue to maintenance and reconstruction purposes.

The total expenditure for maintenance and reconstruction charged against revenue for the last seven years was over $231,500,000.

The associated operating companies (not including the American Telephone and Telegraph Company) show for the year, as compared with last year, an increase is gross of about $10,000,000; operating expenses and taxes increased $2,484,000. (Total taxes paid, $6,316,000.) Charges to maintenance out of earnings increased $5,214,000. Interest charges were $80,000 more. The balance available for dividends was $30,899,000—$2,217,000 more. Dividends to the amount of $22,610,000 were paid, an increase of $1,004,000.

The undivided profits were $8,289,000, an increase of $1,212,000.

ENTIRE BELL SYSTEM IN UNITED STATES.

Comparison of earnings and expenses, 1908 and 1909. (All duplications, including interest, dividends and other payments to American Telephone and Telegraph Company by associated holding and operating companies excluded.)

	1908	1909
Gross earnings	$138,144,300	$149,914,700
Expenses operation	48,081,900	49,732,000
Expenses taxes	5,558,100	6,976,300
	$ 53,640,000	$ 56,708,300
Balance	$ 84,504,300	$ 93,206,400
Maintenance and depreciation	39,736,700	44,838,900
Net earnings	$ 44,767,600	$ 48,367,500
Interest	10,874,100	10,221,400
Balance	$ 33,893,500	$ 38,146,100
Dividends	20,719,000	23,910,600
Undivided profits	$ 13,174,500	$ 14,235,500

COMBINED BALANCE SHEET, 1908 AND 1909.

(Duplications excluded.)

Assets:	1908	1909
Contracts and licenses	$ 8,107,600	$ 7,212,800
Telephone plant	528,717,000	557,417,100
Supplies, tools, etc	15,618,100	17,048,200
Receivables	23,283,800	49,744,900
Cash	53,827,600	32,055,900
Stocks and bonds	37,032,500	38,166,300
Total	$666,586,600	$701,645,200
Liabilities:		
Capital stock	$304,139,100	$352,904,100
Funded debts	236,017,400	187,685,300
Bills payable	35,680,800	40,721,600
Accounts payable	21,488,600	24,633,800
Total outstanding obligations	$597,325,900	$605,944,800
Surplus and reserves	69,260,700	95,700,400
Total	$666,586,600	$701,645,200

The gross revenue collected from the public for telephone service by the Bell system—not including the connected independent companies—was $150,000,000; an increase of nearly $12,000,000 over last year. Of this, operation consumed $50,000,000; taxes, $7,000,000; current repairs and maintenance of property and provision for depreciation $45,000,000.

The surplus available for charges, etc., was $48,400,000, of which $10,220,000 was paid in interest and $24,000,000 paid out in dividends to the public.

The capital stock, funded and floating debts outstanding in the hands of the public at the close of the year were $581,300,000. The surplus of liquid assets was $57,200,000, leaving $524,000,000 as the net obligations of all the system to the public.

Against the obligations, the companies had property $612,600,000,—an excess of $88,600,000, or seventeen per cent.

In addition, there is the intangible property, such as licenses, contracts, patents, right of way, etc.,—not including any public fanchises—of great value, which it would now be difficult to obtain at any price.

In every case where the public authorities have appraised the plant of the companies, the valuation has been far in excess of the book valuation. It is within the bounds of conservatism to say that the obligations of all the companies outstanding in the hands of the public are represented by 150 per cent of property at a fair replacement valuation of the plants and assets, not including public franchises.

WESTERN ELECTRIC COMPANY.

The policy adopted last year with regard to the Western Electric Company has been more than justified. The company for the year 1909 shows an improvement of $3,125,053 in net over the previous year.

Both the foreign business and the domestic business other than with the Bell system show a marked improvement over last year.

The business is being concentrated at Hawthorne as fast as possible; as soon as completed, the company will have for sale real estate valued at several millions.

Since the close of the year, the company has disposed of $5,000,000 two-year four and one-half per cent notes, and $8,750,000 of its five per cent bonds. The proceeds of these sales will enable the company to pay off all its floating debt and have working capital sufficient for a largely increased business.

REPORT OF THE AMERICAN TELEPHONE AND TELEGRAPH COMPANY.

The improvement which has marked previous years still continues. The net revenue for the year was $30,190,765.86, out of which were paid interest $7,095,377.34, and dividends $17,036,275.64. The balance, $6,059,112.88, shows an increase notwithstanding the large increase in dividends due to the exchange of convertible bonds for shares.

At the close of business December 31, 1909, $101,861,000 of the $150,000,000 convertible bonds sold had been handed in for conversion, leaving outstanding at that date $48,139,000.

Due to the conversion of the bonds, and the sale of the shares of the company which were in the treasury, there

has been increase of $97,998,700 in the outstanding share capital. This increase has been well distributed. The number of shareholders, 35,823 on December 31, 1909, shows an increase of 9,453 during the year. The distribution is general, there being 35,510 shareholders out of the 35,823 holding in blocks of less than 1,000 shares each, 1,700,543 shares—an average of forty-seven shares each. The distribution continues, as the number of shareholders has increased 1,500 during the first two months of the present year.

Some effort has been, and is being, made to make a closer adjustment of the boundaries of the associated companies to the commercial or geographical boundaries.

This has been completed during the past year in the Middle States by bringing together into the New York Telephone Company and the Bell Telephone Company of Pennsylvania the territory naturally belonging to each. In both cases this was accomplished by a virtual consolidation of the various companies operating in the territory, and in both cases the outstanding obligations after the consolidation showed a considerable reduction below the total outstanding obligations of the various companies combined.

Mr. Vail makes a comprehensive survey of the development of the Bell telephone system, tracing its historical evolution, through its various mutations down to the present time, and points out the effects of competition, both as regards rates for service and improvement of service to the subscriber. This portion of the report presents many interesting sidelights upon this great enterprise, and will be reviewed at length in a later issue.

Respecting the Western Union Telegraph Company, Mr. Vail says:

In taking over a substantial interest in the Western Union Telegraph Company, this company assumed a substantial obligation to the public in addition to that which it already had. To make clear the extent of this obligation and the resulting advantages, and to illustrate the various shades of relation between the telegraph and telephone, some explanations will be interesting and instructive.

The connection or relation between the telephone and the telegraph is not in any sense one of substitution, it is supplementary; one is auxiliary to the other.

Telegraphy eliminates the time of transit of correspondence, by the electrical transmission of the text from office of origin to office of destination, but it is incomplete in that the methods of collection and delivery are slow and primitive.

Telephony eliminates distance by placing parties at distant points in direct personal communication with each other, but the expense prohibits its use for the transmission of written messages over long distances.

Telegraph operation as carried on must have a separate, distinct and entirely different operating organization and equipment from that of a telephone company.

Line construction and maintenance are common to both the telephone and the telegraph, and can be combined or performed jointly with economy. The same wires may be used for both telephone and telegraph circuits and at the same time. The differentiation between telephone and telegraph construction and operation begins with the stringing of the wires.

Where there is density of message traffic sufficient to keep busy an expert telegraph operator, the telephone cannot be used in competition with the telegraph in the handling of message traffic, but at some point of less density of traffic the telephone will gradually supersede the telegraph in handling message traffic.

The elementary differences in the scope and operation of the telephone and the telegraph in the handling of telegraph traffic indicate that each will occupy a distinct and a well-defined field.

The telegraph between centres of density and for long distances.

The telephone for short distances and for the collection and distribution between the customer and such centres.

About sixty-five to seventy per cent of the telegraph traffic is between, that is, both originates and ends in, about 550 cities and towns of 10,000 or more population. The Western Union telegraph lines reach over 22,000 smaller cities and towns and villages, at most of which the commercial telegraph traffic would not of itself support a telegraph office. This business is now being performed necessarily under some joint arrangement, for the greater part with the railroad companies. While these arrangements will be continued, a greatly extended and improved service will be given in connection with the Bell system with over 5,000,000 stations located in 50,000 cities and towns, most of which will be put in immediate connection with telegraph offices at central points. In this way the electrical transmission of messages will be extended from the actual point of origin to the actual point of destination.

There are comparatively few places where there is business enough to warrant a "night and day" telegraph service, but there is no place where "night and day" telegraph service is maintained that is not in the centre of a "Bell system." Practically no Bell exchange is ever closed—therefore there are few subscribers of the Bell system who cannot be placed within reach of night and day telegraph service.

Under the new conditions, when in full operation, each service, the telephone and the telegraph, will find its level of use, its fields of best usefulness, with a distinct improvement in, and advantage to, both services.

Such economies as follow will be taken advantage of to increase the facilities and where possible reduce the cost to the public.

Before any change can be made in the existing rates for existing service, it will be necessary to await the result of studies now being made, as it is claimed that the irreducible cost of handling is so near the revenue received for each commercial message that no reduction in rates would be justified by any probable increase in business.

BALANCE SHEET, DECEMBER 31, 1909.

ASSETS.

Stocks of associated companies	$306,948,309.10	
Bonds of associated companies	3,527,000.00	
Capital advances to associated companies	49,990,850.38	$360,466,159.48
Telephones	$ 10,510,702.91	
Real estate	2,181,728.67	
Long-distance telephone plant	44,295,659.76	56,988,091.34
Cash and deposits	$ 19,654,016.04	
Temporary cash loans	11,418,000.00	
Short term notes	12,022,466.52	43,094,482.56
Special demand notes		26,775,000.00
Current accounts receivable		6,766,073.28
		$494,089,806.66

LIABILITIES.

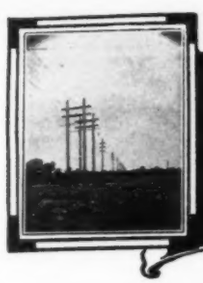
Capital stock		$256,475,300.00
Four per cent collateral trust bonds, 1929	$ 53,000,000.00	
Four per cent convertible bonds, 1936	48,139,000.00	
Four per cent American Bell bonds, 1908	1,000.00	
Five per cent coupon notes, 1907	5,000.00	
Five per cent coupon notes, 1910	25,000,000.00	
Indebtedness to Western Union Telegraph Company for New York Telephone Company stock, payable 1910 to 1915	22,500,000.00	148,645,000.00
Dividend payable January 15	$ 5,137,528.66	
Interest and taxes accrued, but not due	2,634,039.49	
Current accounts payable	714,996.91	
Reserve for unearned revenue	102,334.93	8,588,899.33
Depreciation reserve	$ 33,693,547.78	
Surplus	46,687,059.55	80,380,607.33
		$494,089,806.66

COMPARATIVE STATEMENT OF EARNINGS AND EXPENSES.

Earnings:	1908	1909
Dividends	$13,280,127.54	$15,949,213.73
Interest and other revenue from associated companies	9,720,466.04	10,661,431.03
Telephone traffic (net)	3,976,512.07	4,360,104.94
Real estate	160,007.95	95,723.97
Other sources	761,856.45	1,694,867.76
Total	$27,898,970.05	$32,761 341.43
Expenses	2,003,956.06	2,570,575.57
Net earnings	$25,895,013.99	$30,190,765.86
Deduct interest	7,773,306.73	7,095,377.34
Balance	$18,121,707.26	$23,095,388.52
Dividends paid	12,459,156.00	17,036,275.64
Balance	$ 5,662,551.26	$ 6,059,112.88
Carried to reserves	3,000,000.00	3,000,000.00
Carried to surplus	2,662,551.26	3,059,112.88
	$ 5,662,551.26	$ 6,059,112.88

The officers of the American Telephone and Telegraph Company are:

President, Theodore N. Vail; vice-presidents, Edward J. Hall, H. B. Thayer, B. E. Sunny, U. N. Bethell, William R. Driver, Charles P. Ware; treasurer, William R. Driver; secretary, Charles Eustis Hubbard; directors, Charles W. Amory, George F. Baker, Francis Blake, Alexander Cochrane, T. Jefferson Coolidge, Jr., W. Murray Crane, Henry P. Davison, Rudulph Ellis, Henry S. Howe, Charles Eustis Hubbard, John J. Mitchell, Willam Lowell Putnam, Thomas Sanders, Sylvanus L. Schoonmaker, Nathaniel Thayer, Theodore N. Vail, John I. Waterbury, Moses Williams.

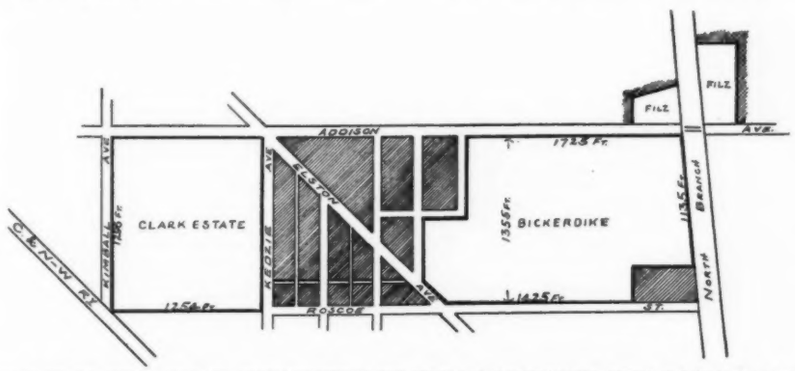


CENTRAL-STATION PRACTICE

Transmission—Interior Wiring

Commonwealth Edison Company Will Build Power Plant to Cost $15,000,000 to $20,000,000.

The Commonwealth Edison Company has purchased 109 acres of land on the west side of the North Branch of the Chicago River between Roscoe street on the south and Addison on the north from various owners for $351,000, on which it will immediately begin the construction of a new turbine generating electric light and power station and possibly two, the total expenditure when the plant is completed being approximately $15,000,000 to $20,000,000. The acquirement of this land has been going on quietly for some time, the first purchase having been made last August.



PLAN SHOWING SITE FOR COMMONWEALTH EDISON COMPANY'S NEW POWER PLANT.

From the heirs of Joseph Bickerdike the principal purchase was made, including fifty-nine acres lying between Roscoe and Addison Streets on the south and north, the North Branch of the Chicago River on the east and Whipple Street and Elston Avenue on the west, for which $195,000 was paid, being at the rate of $3,500 an acre for part and $2,500 an acre for the rest. For thirty seven and one-half acres between Roscoe Street and Addison Street and Kedzie and Kimball Avenues the trustees of the estate of Robert R. Clark were paid $97,473, being at the rate of $2,500 an acre. The ten-acre tract on both sides of the North Branch of the Chicago River on the north side of Addison Street were purchased from Joseph Filz and Mary Geohegan for $30,000. In addition to these the purchase includes seventeen lots and a right-of-way fifty feet wide running from Kedzie to Elston Avenue for an electric railway. The seventeen lots lie in an addition to Avondale, part of a small community contiguous to the Chicago & Northwestern Railroad station of that name.

Mr. Samuel Insull, president of the Commonwealth Edison Company, in speaking of the purchase and plans of the company said:

"We have bought the property for the purpose of building two new generating stations in which six turbines will be installed in each station, or twelve in all. In the first station there will be six turbines, each having a capacity of about 30,000 horsepower, or 180,000 horsepower in all.

"We are building these stations for the natural growth of the business in that part of the city—erecting one station immediately and just as soon as the growth of the business demands it we will erect a second with about the same capacity. It is quite possible that at this place we will erect generating plants having a capacity of 350,000 horsepower.

"We have had in mind the requirements of the future in buying this property, and while we will in all probability have 60,000 horsepower in operation within two years, it will be some years before we will have the entire plant as contemplated completed, which will involve when finished a total investment of $15,000,000 to $20,000,000."

The Commonwealth Edison Company now has at its two stations on the South Branch at Fisk and Quarry Streets the largest stations of the kind in the world, including the additions being made this year, about 300,000 horsepower, having ten turbines in the Fisk Street station, with a capacity of about 18,000 horsepower, and six in the Quarry Street station; the last three to be put in this year will average 21,000 horsepower. The two new stations which the company has in contemplation will each be of the same capacity as the Fisk Street plant.

An idea of the magnitude of the new plant and the growth of the business may be had from the fact that the company early in 1902 purchased for $337,700 almost twelve acres on the river at Quarry and Fisk Streets for what was then considered an enormous plant, involving a contemplated expenditure of $6,000,000, but this has grown in less than eight years until it now represents an investment of over $15,000,000. Since that time there have been additions to the holdings of the company at that place, until they now include about thirty-two acres, and yet it is cramped for space, while the new plant northwest on which it is about to begin construction will involve a total cost of two and a half to over three times as much as the stations referred to. The output of the Commonwealth Edison Company for the last twelve years has as a matter of fact more than doubled every three years.

The buildings comprising the Fisk Street generating station are the best in the city, not only in their construction, but design and equipment, and the new stations will be of the same high

order. The buildings for the new station will be designed by architects Holabird & Roche, who will also superintend their construction. The mechanical part of the station will be designed by Frederick Sargent, of Sargent & Lundy, and the electrical department by the staff of the Commonwealth Edison Company.

Proposed 600,000-Horsepower Hydro-electric Plant.

According to the *Canadian Electrical News*, the Long Sault Development Company, in conjunction with the St. Lawrence Power Company, proposes, if its scheme is approved at Ottawa, to build a 4,500-foot dam, forty-five feet high, across the St. Lawrence river at the head of the Long Sault rapids, and to build an electric plant to develop 600,000 horsepower. The project is favored by the towns and municipalities in the vicinity, which hope to profit by cheap power. Opposition is being raised by the Ontario Government, the Conservation Committee at Ottawa, and various other bodies, who see in the proposal a possibility of an encroachment on Canadian resources for the development of United States enterprises. It is also feared that the navigability of the river may be affected by the diversion of so great a quantity of water. The latter objection, however, is met, for the companies, by a promise to provide a new ship channel of ample proportions on the south side of the river. Apparently almost unlimited capital is behind the scheme, which is planned to cost in the neighborhood of $20,000,000.

Prefers Meters to Flat Rate.

The city of Nelson, B. C., has decided to abolish the use of the flat rate for the supply electricity to householders, and will install meters at the cost of $15,000. It is estimated that the consequent yearly gain in revenue will amount to $10,000, and that the city will further avoid the necessity of expending between $4,000 and $5,000 on additional transformers and wiring.

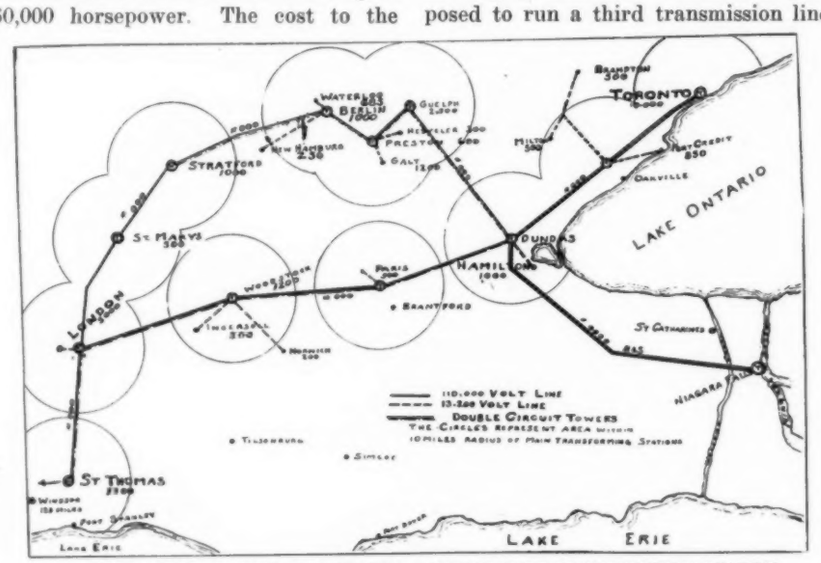
American Electrochemical Society.

The date of the annual meeting of the American Electrochemical Society to be held in Pittsburg has been changed from the last week in April to May 5, 6, 7. An attractive programme has been prepared.

The Ontario Government High-Tension Transmission System.

In a recent issue of the *Canadian Electrical News*, of Toronto, Canada, P. W. Sothman gave an account (from which the following is abstracted) of the system of power distribution at present being rushed toward completion in southwestern Ontario by the "Hydro-Electric Power Commission" of the Ontario Government. The Commission will deliver power to the boundary line of each municipality in the area shown in the accompanying map, further distribution being effected by the local authorities. Energy is delivered at a pressure of 13,200 volts.

The power is supplied by the Ontario Power Company, of Niagara Falls. The contract calls for an amount up to 60,000 horsepower. The cost to the municipalities is fixed according to the various factors involved in the scheme of distribution.



AREA SERVED BY THE ONTARIO GOVERNMENT TRANSMISSION SYSTEM.

The Ontario Power Company's plant is situated on the Canadian side of the river just below the falls. The generating station stands beneath the rocky cliff almost on a level with the river. The water used for power generation is taken from the river at a point some half-mile above the falls, and carried by an eighteen-foot circular, metal, conducting tube from this point, along the bank of the river, to the generating station. This conduit tube supplies sufficient water for seven large turbines aggregating 80,000 horsepower. A second conduit tube, also eighteen feet in diameter, is at present being laid. This will double the capacity of the plant and make it one of the largest hydro-electric generating stations in the world. A third conduit tube is projected, which will bring up the total capacity of the plant to 220,000 horsepower. Just over the hill behind the power house, the Commission is building a 60,000-horsepower transforming station, to which the Ontario Power Company will deliver current through underground conduit at a pressure of 12,000 volts. The current will be stepped up to 110,000 volts for distribution purposes.

In the map shown herewith, the figures below the names of the towns and cities indicate the minimum horsepower to be taken or paid for by the individual municipalities. The total amount to date is 30,000 horsepower, which will be largely increased. Later it is proposed to run a third transmission line south and west from Dundas to St. Thomas.

The center of the distributing system is at Dundas, seven miles from Hamilton. From the generating station to Dundas the current is carried by No. 0000 B. & S. aluminum cables. From Dundas out, east to Toronto and west to St. Thomas, London, Stratford, etc., the cables are No. 000 B. & S. aluminum. The total length of the line being installed at present is about 290 miles. Throughout this distance the pressure is 110,000 volts. As indicated in the map, there is a double transmission line, consisting of two sets of three cables each, carried by a single row of double circuit towers, from Niagara Falls to Dundas and from Dundas to Toronto. The line from Dundas to Stratford by the upper route, and from Dundas to Lon-

don and St. Thomas by the lower route is a single-circuit three-cable line as yet, but provision has been made for doubling the capacity of this line in that all towers installed on this section are also double-circuit towers. From Stratford to London the line is equipped for single circuit only.

The transmission lines, for the most part, and other things being equal, follow a course as the crow flies. In many cases, however, it has been deemed advisable to diverge somewhat from this rule in order to follow along a highway or cross in the vicinity of railway stations or villages—the necessity for this will be evident when it is remembered that each point in the transmission system will be patrolled every day. As a general rule, paralleling of steam railroads has been avoided on account of the oil, soot, smoke, etc., which are found there and which, by settling on the insulators, have been shown in a number of cases where transmitting wires have been so placed to greatly reduce their insulating capacity. In one other instance, the main line from Niagara Falls to Dundas, the wires were placed many miles farther south than was at first planned in order to keep clear of an area in which violent electric storms are known to be frequent. This information was gleaned by actual and systematic inquiry among the oldest inhabitants and by studying the records of the telephone and telegraph companies operating in this district. The greatest care was taken to make this investigation complete and it is believed that, as a result, the zone through which our transmission line passes is reasonably safe from extraordinary lighting occurrences.

Referring again to the map, it is seen that the transmission lines west from Dundas form a complete loop. The projected third line running south through Simcoe, Tilsonburg, etc., will run all the way to St. Thomas and form a second complete loop. In the near future it is planned that another line will join Guelph through Georgetown and Brampton with Toronto, thus forming a third loop. By this plan of looping it is hoped, in case of accident to the line, to avoid interruptions in the service at any point other than where the accident actually occurs. For example, suppose the transmission line is broken between Berlin and Stratford; this would ordinarily deprive Stratford and St. Mary's of power and light. By the existing arrangement, however, the current through Woodstock can be switched on at London and power supplied to both ends of the broken line from opposite directions.

Metal towers are being used throughout, one of which is shown in the accompanying diagram. In all, about

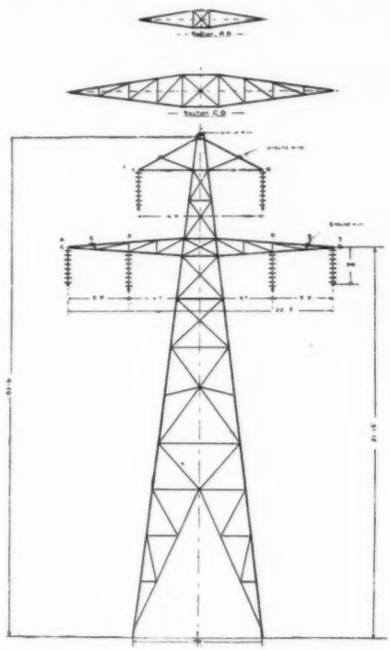


DIAGRAM OF METAL TOWER USED ON TRANSMISSION LINE.

3,000 towers will be required for the 290 miles; an average of ten to the mile, or one every 525 feet, though special conditions may cause these distances to vary. Before deciding on the particular type of tower to be used, exhaustive strain tests were made in different directions and at different angles.

The height of a tower is sixty-five feet six inches over all; the upper arm is sixteen feet ten inches, the lower arm thirty-five feet two inches in length. The conducting cables of each circuit are approximately nine feet apart. A complete insulator is five feet two inches in length. The tower base is square, seventeen feet to a side. The tower footing is sunk seven feet six inches in the ground. No concrete is used except in rare cases, such as soggy ground or hillsides. The bottom six inches of the hole is filled with fair-sized stones; then a twenty-two by thirty-four-inch iron grate placed horizontally is bolted to the iron foot; earth is filled in to within eighteen inches of the surface where more stones are used.

Where the Welland Canal is crossed much higher towers are to be used to raise the wires 150 feet above the highest water level, as required by law.

The weight of the standard towers is 3,995 pounds. Towers are shipped in sections about twenty-two feet long, and each is assembled lying on its side close to the footing excavations. They are erected by block-and-tackle arrangement, one team of horses being sufficient. To erect a completed tower requires from ten to twelve minutes only.

A large number of various types of insulators were submitted for comparative tests. It was necessary to take into account the fact that although the line was nominally carrying a 110,000-volt current, yet abnormal conditions may set up surges on such a long line sufficient to raise the voltage momentarily well up to 200,000. For this reason severe tests were made, under both wet and dry conditions, with voltages up to 400,000. Strain tests were also made to determine the mechanical strength of the various types. The choice of a proper insulator was considered of such importance that two engineers spent three months making these tests before it was entirely evident which was the very best of all the types submitted. The final choice may be described as a one-piece, eight-unit, suspension-type insulator. The total length of the insulator is five feet two inches, the width of each unit eleven inches. There are no sharp corners about the pattern chosen, from which discharges may easily leak off; also the different sections are connected by a ball and socket arrangement allowing freedom of movement. When this insulator is in position on the tower its lowest point is forty-six feet high.

Lightning troubles are guarded against by the erection of parallel ground wires, the whole length of the transmission line, which are placed on the upper side of the tower arms, near the ends of the arms, and in this position they form a sort of canopy over the transmission cables. The ground wires are of galvanized steel cable, each being naturally earthed by metallic contact with the towers. Provision is made for a fifth ground wire on the very peak of the pole, but it is not thought this extra cable will be necessary.

BALANCERS FOR THREE-WIRE SYSTEMS.[1]—I.

BY A. G. COOPER.

The aim of every engineer is, of course, to balance his system, if possible, by judicious connecting up of his consumers, but it is impossible to do so for all hours of the day and days of the week, so he wants the most reliable and at the same time economical piece of apparatus to do the necessary when called upon. Frequent causes of out-

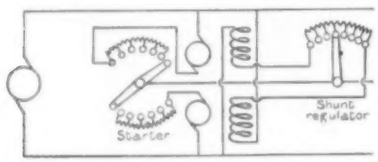


FIG. 1.

of-balance current are arc lamps for cinematograph entertainments, but the author has declined to supply these except through motor-generators, as he found it was imperative to adopt this course on his small network. He is pleased to say that he has a very small out-of-balance current, and it has therefore been necessary artificially to produce the out-of-balance tests given later in the paper.

There are several forms of continuous-current balancers, but the one most commonly used consists of two-shunt machines mechanically coupled together, with their shunts cross-connected, viz., the field being connected to the opposite side of the system to that of the armature which is rotating in it, as shown in Fig. 1. The two machines

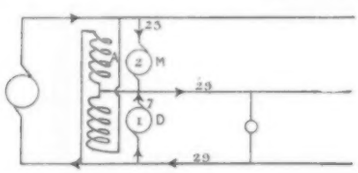


FIG. 2.

must be of such capacity that they are capable of continuously carrying a little more than half the observed out-of-balance current. It will be seen from Fig. 2 that the current flowing in the middle wire splits itself, part going through *M* and part through *D*. There will be more current through *M* than *D*, which in the diagram represents motor and dynamo respectively when the out-of-balance current is flowing in the direction indicated. The action of the machine depends upon an increase or decrease in voltage on either side of the system. If there is an out-of-balance current on the positive side the voltage on that side will fall in proportion to it. This will produce a weaker field at A in which No. 2 armature is running. It now acts as a motor and increases in speed and drives No. 1 faster. The increased speed will naturally produce a higher voltage, which is still further increased by the field in which No. 1 is running, as it is connected to the negative side. The positive voltage will thus rise, but being the heavier side will still be lower than the negative. The extent will be according to the design of the balancer. The machines act as dynamo or motor according to which side is out of balance.

The following figures give the tests of a machine of this type capable of dealing with 150 amperes out-of-balance, at the same time driving two

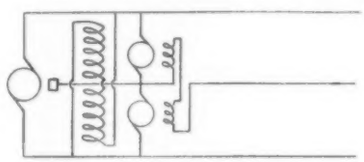


FIG. 3.

boosters eighty volts eighty amperes each on a 480-520-volt system. The machine was disconnected from the middle wire and driven as a motor and was found to take 8.3 amperes at 500 volts, viz., 4.15 kilowatts per hour. The fields took 1.3 amperes, which are included in the consumption given. The boosters were not excited, but the armatures were mechanically coupled, so there would be the loss due to friction and windage

The voltage varied to the extent of one volt for every ten amperes out-of-balance. This works out at three per cent. difference at full load. Fig. 1 illustrates a good method of starter, and also a center contact field regulator to enable the attendant to alter the voltage due to the out-of-balance current so as to maintain the voltage equal or, if necessary, raise it on the out-of-balance side; but this is not necessary unless it is desired to take charge of only a single feeder, because if it is running on the station busbars the voltage on one side to suit one feeder would probably act detrimentally upon the other feeders, unless they were all out-of-balance on the same polarity.

An improvement on the above figure, viz., three per cent., can be obtained by putting on some series turns to compensate for the armature drop, but to get the best effect and to avoid other complications in case of a heavy short these coils should also be cross-connected (see Fig. 3). The action of the series winding will be as follows: The motoring current, which will be the heavier, will pass round the dynamo fields in the

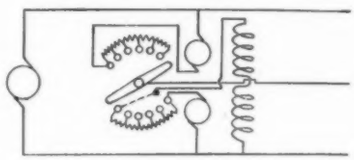


FIG. 4.

same direction as the shunt current, thus producing a strong field. The dynamo current will also flow round the motoring side field, but in opposition to the shunt, which will have the effect of speeding up the armatures, thereby raising the voltage on the out-of-balance side. By over-compensating the armature drop by additional series turns the out-of-balance side can be even raised above the opposite side.

In Fig. 4 another form of balancer is shown. This machine has a single-shunt field connected across one of the outers and the middle. It has a double-wound armature with a commutator at each end. This is rather a poor balancer and is really only a middle-wire former. It is rated to deal with twenty-five amperes out-of-balance, but is only used

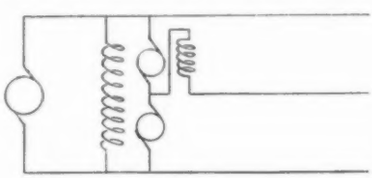


FIG. 5.

for very light loads and during the early hours of the morning instead of running the larger balancer, as the author has no battery in his works. This machine was very much improved by using a more suitable type of brush than was supplied with it. The power absorbed to drive this machine is 1.125 kilowatts per hour.

In Fig. 5 a balancer of somewhat similar construction is shown, inasmuch as it has a double-wound armature with a

1 Abstract of a paper read before the Manchester (England) section of the Institution of Electrical Engineers, February 8, 1910.

commutator at each end, but the armature is specially wound, one set of windings being shorter than the other, as shown in Fig. 6. This does not show the true positions of the conductors, as it is a two-pole machine, the conductors being drawn thus for clearness.

As the end windings of the left-hand side are placed between the main and auxiliary magnets, the conductors from that end do not come under the influ-

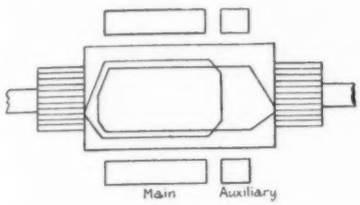


FIG. 6.

ence of the auxiliary magnet. The main magnet is shunt-wound and connected across the outers. The auxiliary pole has a series winding only, which is connected in the middle wire. It will thus be seen that the polarity will change according to which side is out-of- balance, and the pole strength will vary according to the out-of-balance current.

The short lengths of the windings of the right-hand side will have voltage induced in them either in conjunction or in opposition to the remainder of the windings rotating in the main field. This type of machine has been in use for a number of years at Blackburn, and has given every satisfaction. It will maintain the voltage equal within one per cent over the whole of its range. This type of machine, of which a sketch is given in Fig. 7, can be

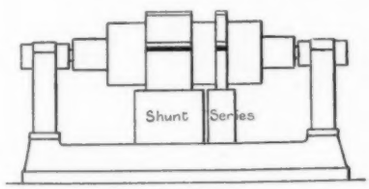


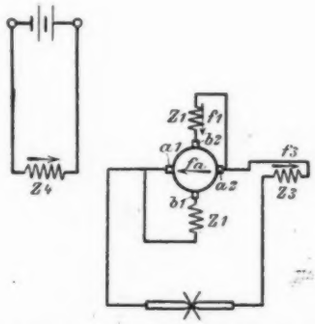
FIG. 7.

wound, I should think, to give a perfect balance, or even to boost the out-of-balance side unless troubles are experienced with the magnetization due to the weak currents when there is a small out-of-balance, or to the residual magnetism when the balance is perfect. This could be got over by having a shunt winding and so working on a flatter point of the magnetization curve and letting the series winding help or oppose it according to its direction.

(To be continued.)

New Direct-Current Machines for Constant Current, Their Theory and Development.

The electrotechnical literature of recent years contains several treatises dealing with so-called self-regulating direct-current dynamos, that is, machines which on account of their special connections and construction possess operating properties that are valuable for certain purposes. To this class belong train-lighting dynamos and the constant-current machines employed for operating searchlights and welding machines. Although the requirements made of such machines may appear to differ widely, closer investigation will easily show that fundamentally their methods of operation possess great similarity. In the present article L. Monath describes a new constant-current dynamo and single-armature converter for constant current de-



CONSTANT-CURRENT GENERATOR.

veloped from the well-known train-lighting dynamo of the Felten & Guilleaume-Lahmeyer Company. All of these machines were invented by M. Osnos. In the diagram a_1 a_2 are the main brushes of the machine, b_1 b_2 the auxiliary brushes located electrically at right angles to the main brushes; z_3 is a compensating winding arranged on the frame and is traversed by the working current flowing through the armature. This winding is not absolutely necessary and serves only for adjusting the transverse field, which is proportional to the current, to a desired value. A second component of the transverse field independent of the current is excited in the winding z_4, which for this reason is fed from a battery or other supply circuit. The main exciting winding is divided into two halves. The vertical field excited by it produces, upon rotation of the machine, the main tension between a_1 a_2, while the armature field, the field of the compensating winding and the transverse field z_4 produce a tension only between the auxiliary brushes b_1 b_2, as the diagram shows. The machine is thus virtually a shunt dynamo, into the main exciter winding of which there is connected, by means of the auxiliary brushes, an opposing tension influenced by the current and dependent on the resulting transverse field. But as the transverse field has a constant component working against the current field, to which corresponds a constant-tension component in the main exciting circuit in the same direction as the tension between the main brushes, the dynamo is actually one of mixed, that is, separate and self-excitation, in which a weakening of the main field is dependent upon the working current and effected by means of the auxiliary brushes. An exhaustive graphic treatment of the entire problem follows this explanation, the processes going on in the machine being explained thereby and the basis for its design and calculation established.—*Translated and abstracted from Elektrotechnische Zeitschrift (Berlin), February 10.*

A New Police and Fire Alarm System.

Patents have been applied for by Louis W. Miller, Rochester, N. Y., covering an automatic police and fire alarm system which, it is claimed, enables the head of a department to communicate, quickly, with patrolmen scattered over a wide area on their beats.

The system comprises a switchboard, comparatively small, connected by telephone with every patrol box in the field, so equipped that when the commander of a precinct wishes to talk with an officer on his beat he can summon him by gong or by colored lights, or both, by the pressure of a button. The response by an officer is automatically registered, whether he talks or not, by a specially constructed time clock. This record and all records of reports by officers are in constant view for twelve consecutive hours, and are instantly available by the commanding officer.

The invention also includes a complete fire alarm system with many practical advantages. It also includes a night watch service for factories which embodies many of the commendable features of the other systems.

ELECTRIC LIGHTING and ILLUMINATING ENGINEERING

ELECTRIC LIGHTING OF THE NEW THEATRE, NEW YORK CITY.

ILLUMINATION PROBLEMS OF THE MOST ARTISTIC AND UP-TO-DATE THEATRE IN AMERICA.

In consequence of the diverse character of the productions, operatic, dramatic, and orchestral, intended to be shown at the New Theatre, Central Park West and Sixty-second Street, New York city, the mechanical and electrical equipment of that most modern of playhouses is of the most up-to-date and elaborate kind. Backed with practically unlimited capital, by men who seek no interest on their investment but whose aim is rather to foster and uplift the status of theatrical art in this country, the appointments of the New Theatre are extravagant in their completeness and luxuriousness, and include practically every device known to the theatrical architect, mechanician, and producer. In addition to unusually commodious dressing and rehearsal rooms, seating capacity, halls and foyer, executive and lounging rooms, etc., there are included a buffet, tea rooms, libraries, a roof garden and terrace. The stage is one of the most unique in existence, and is a four-part affair with a revolving floor so that it is possible to set four scenes at once and present these successively by merely turning the structure through a right angle at each shift, thus eliminating the tiresome entr'actes so common in many high-class theatres. A second stage is also available in a pit below the main stage, and this may be elevated when required to replace the stage being used. Indeed, a whole volume might well be written on the mechanics and mechanism involved behind the footlights, but as the main purpose of this article is to describe some of the illumination features and the equipment pertaining thereto, the above brief mention will have to suffice.

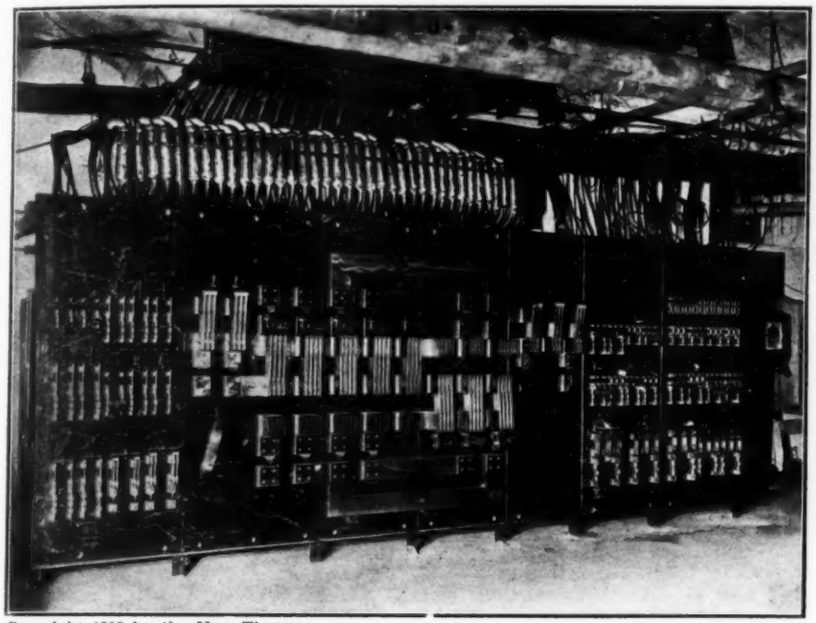
FOYER OF THE NEW THEATRE.

THE NEW THEATRE, NEW YORK CITY.

The electrical load taken by the New Theatre, including as it does about 19,000 incandescent electric lamps and 1,131 horsepower in motors, presented such a problem that it was found necessary to run two special feeders from the New York Edison Company's substation, besides looping in two mains and tapping from another main. In addition to the three independent services required by New York city ordinance, one for auditorium and stage lamps, one for corridor and public-passage lamps, and one for red-lamp exit signs, the engineers responsible for the design and layout of the electric service provided a separate circuit for the motors. Another innovation was the placing of the meter for the red exit lamps on the service switchboard, thus reducing the number of fuses to a minimum and lessening the chances of a mishap to these lights.

The general distribution switchboard, a view of which is shown in one of the accompanying illustrations, is made of marbleized slate with connections on the back of the board. The feeders, twenty-six in number, which terminate in the space above the board, are hard-drawn copper rods covered with circular-loom conduit, and are supported by porcelain insulators fastened to iron bars. The rods are joined to the feeder cables by Dossert connectors. Mounted on the wall behind the board and running the full length of it is a meter board on which are mounted twenty-four meters. This large number of

small individual meters permits of more accurate metering, and provides almost one meter for each section. The meters



Copyright 1909 by the New Theatre.

THE GENERAL DISTRIBUTION SWITCHBOARD.

for the large sections are connected in parallel.

Switches are provided for the various lighting groups as follows: one each for stage lamps, auditorium lamps, executive rooms south, executive rooms north, carriage calls, corridors, roof festoons and decorations, buffet and basement, dressing rooms north, and roof garden; two each for marquise south, marquise east, and for marquise north (this to be added later); one for the lamps in the basement fanroom, one for the ceiling lamps, ten for the engine-room lamps, and three for lamps to be added in the future. Motor switches are also provided on this board.

Copyright 1909 by the New Theatre.

MAIN LOBBY OF THE NEW THEATRE.

Rigid iron conduit is used in most cases to inclose the wiring. The twenty-six feeders terminate in the form of a large pull-box above the switchboard. Those portions of the distributing system not controlled from the stage switchboard are fed directly from the main switchboard by sets of feeders inclosed in iron conduit exposed on the basement ceiling to the riser shaft and looped up therefrom through various distributing boxes. Large boxes are used for the feeders which are supported inside the boxes on porcelain cleats.

The service switchboard is also of marbleized slate, and double-throw switches are provided thereon for convenience in removing blown fuses, either those on the board itself or those for the feeders in the street outside. Paper-insulated cable is used, with potheads at both ends of the run, and provision has been made for a future possible change-over to isolated-plant service.

The lighting fixtures of the New Theatre are arranged on two circuits, one-third on one circuit and the remainder on the other. This provision is made for convenience in cutting lamps out of circuit during the performance, and to enable the corridor lamps and the lights in other public passageways, etc., to be dimmed as a signal that the performance is about to commence. The extra cost (nearly 100 per cent) entailed by this double-circuiting will probably be compensated for by the saving in current that is made possible by its use.

The operator of the stage switchboard is conveniently located under a hood in the center front of the stage, so that his eyes are just above the stage floor in order to enable him accurately to judge of the lighting effect. This operator has control of the master switches and dimmers for the stage and auditorium lights, as well as of the individual switches and dimmers. Remote control is used exclusively, thus simplifying the whole arrangement and permitting a small and convenient board to be used. The dimmers are motor-operated, and their design, as well as that of the stage switchboard, involved many special problems.

For the illumination of the main auditorium there is provided one of the finest electroliers that has ever been constructed. This magnificent fixture, which is shown in one of the accompanying illustrations, contains no less than 300 lights, with the frosted ball

lamps arranged in circles in the form of an immense inverted cone. The electrolier is suspended by means of a pin passing through an eyebolt, and a block is provided for lowering the fixture to the floor for cleaning and lamp renewals. The circuits can be disconnected by an arrangement of lugs and wing nuts in the distribution box located in the space above the electrolier, when the latter is to be lowered. The finish of the electrolier is in old brass, and the appearance is extremely pleasing and artistic, as may be judged from the illustration shown herewith. One-third of the lamps are arranged on one subfeeder from the stage switchboard, and the remaining two-thirds on another subfeeder. In addition to the 300 lights on the electrolier itself there are 250 extra lamps concealed in a cove around the large oval panel situated above the fixture. These lamps are provided with mirror reflectors designed to distribute the light over the panel.

Of less size, but no less in artistic effect, are the twenty-lamp crystal electroliers, suspended over the balcony colonnades, six on each side. These are shown in an accompanying illustration.

In connection with the orchestra lighting, a special problem was introduced by the provision that has been made to elevate the floor of the orchestra pit in order to increase the stage accommodation for Shakespearean plays. For this reason, the orchestra lamp-circuits are taken through single-lamp floor plugs, sixty in number, set in the floor of the orchestra pit, and the outlet boxes are connected by reinforced flexible cable to other permanent outlet boxes set in the pit below.

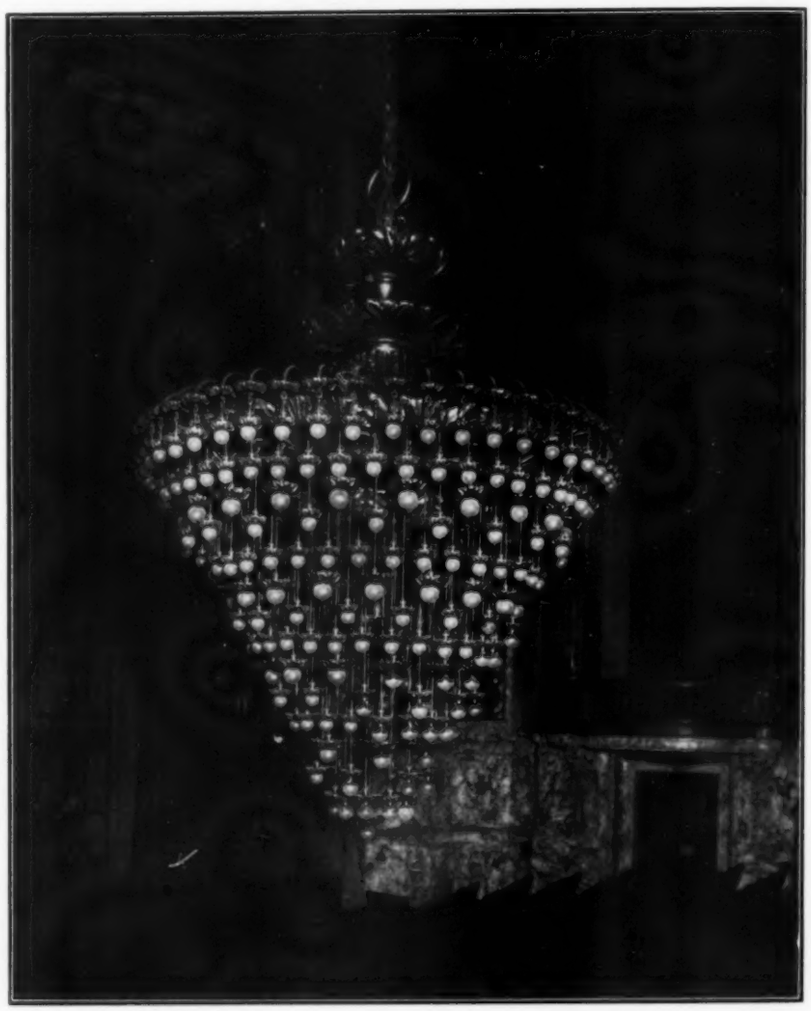
Around the back of the ceilings of the balconies are arranged friezes of lamps, the latter being provided with continuous-mirror reflector settings and covered in front with cathedral amber glass. The entresol balcony has around it a frieze of studded lamps which are set in outlet boxes with flush covers. The covers are made up of glass beads.

On either side of each of the boxes there is a single-lamp fixture. A two-lamp fixture provided in the center of the anteroom ceiling has one light only connected to the stage switchboard, the other lamp being connected to the corridor circuit. This is one of the many instances in which is shown the object of the designers in providing for economy and utility in the lighting arrangements. Electroliers are used to light the corridors, halls, and foyers. The pendant inverted type of fixture used in the main foyer is shown in one of the illustrations herewith, and it may be noted how well this style of fixture harmonizes with the general architecture of this part of the interior. In fact, throughout the whole of the theatre the sense of proportion, harmony, and artistic effect has been emphasized, as well as the arrangement of the distribution circuits and the efficiency and utility of the general lighting scheme.

The stairways are appropriately lighted by bracket fixtures, and the marquises by lamps fitted in a series of receptacles studded on the soffits under the gutters and surmounted by brass canopies. The wiring for this work is not run in conduit like most of the rest of the electrical work, but is done in lead-sheath, rubber-covered wire run in troughs under the gutters.

Where their use was considered advisable, "linolite" lamps, made by the H. W. Johns-Manville Company, were employed. Notable examples of "linolite" lighting occur in the illumination of the billboards, poster boards, above the ticket windows, and for the footlights. The latter will be described later. In first three instances noted, small bronze reflectors are used with effect, affording a most uniform illumination.

It is the intention of the management of the New Theatre subsequently to equip the roof garden with a regular stage for simple productions, and with this in view a complete system of wiring, with a stage switchboard, dimmers, etc., has been designed. At present, however, the lighting is effected by means of four flaming-arc lamps.



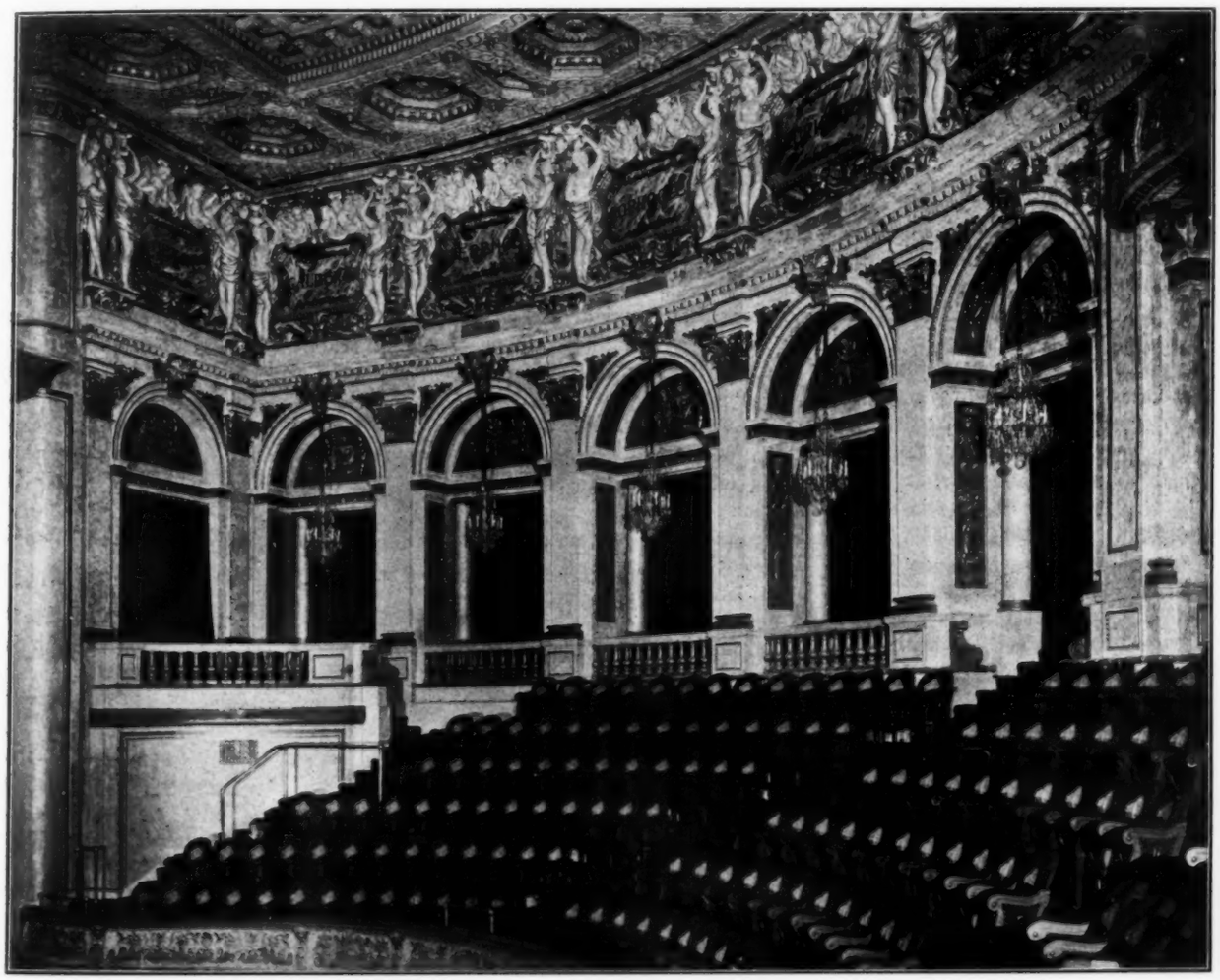
ELECTROLIER IN AUDITORIUM OF THE NEW THEATRE.

There are thirty-seven dressing rooms for the principals, and for each of these rooms there are provided a lamp and reflector over the dressing mirror, and lamps and reflectors at each side of the mirror. These lights, as well as the electric curling iron and the grease-paint heater, are controlled by switches on the side of the table. The wiring of the table is inclosed in conduit, and the lamps, etc., are connected to wall receptacles. The lighting of the chorus dressing-rooms is simpler, single-reflector bracket being used over each table. Mirror reflectors running the whole length of the ceiling and hung in the middle of the room are used in the costume and sewing rooms.

For the stage illumination, a four-color lighting scheme, in red, white, blue, and amber, is used in the borders, strips, foots, and pockets. The borders and foots are arranged in four sections across the stage, four colors each, and each separately dimmed and controlled. As previously mentioned, "linolites" are used for this purpose. These are placed vertically and are used in conjunction with an enameled sheet-steel reflector hinged in sections so that when the Shakespearean stage is to be extended over them they may be folded forward into the footlight gutter. Eight borders are to be used in all. These borders, which have above them a working bridge with hand rails forming part of each border, are used for operating the spot lamps. The light gradation may be made from darkness to full brilliancy from either side of the stage and also from the back to the front of the stage. This is made possible by dividing the 432 border lamps into four sections of each of the four colors previously mentioned, the sections being arranged across the stage. Each lamp is a seventy-six candlepower "linolite."

There are 386 lamps in the footlights, and these are interrupted by the hoods for the prompter and the stage-switchboard operator. On the border bridges are arranged eight fifty-ampere arc pockets, and in the floor of each of the eight entrances to the stage are mounted two fifty-ampere arc pockets and four incandescent pockets. The distribution boxes for the border lamps are on the gridiron, and those for the arc and incandescent pockets just mentioned are in the basement at the side of the stage. The incandescent pockets are also connected to the dimmers controlled from the stage switchboard. All of these pockets are of special design.

The distribution boxes for the wiring throughout the theatre call for some special mention. There are fifty-eight of these in all. The branch circuiting for the boxes is composed of wire insulated with thirty-per-cent Para rub-



DETAIL OF THE BALCONY OF THE NEW THEATRE.

ber. The same kind of wire is used also for the feeders. Each box contains a number of sets of busbars, one set for each feeder. Some of the boxes are used for both lamp and motor circuits, each circuit, as mentioned previously, being kept separate from the other. Double and triple circuits are used for the numerous outlets, and indeed the arrangement is in many cases exceedingly complicated. It may be mentioned here that provision has been made in the wiring design to dim the lamps in and around the stage itself by other means as well as those connected to the stage switchboard, in cases where dark changes are required. In fact, in several other cases this provision has also been made.

Numerous drop lights of the ordinary pattern are also employed in the more or less inconsequential places, in addition to the special illumination features mentioned above.

Among those deserving of special mention in the construction of the New Theatre are: H. Krantz, of the Krantz Manufacturing Company, of Brooklyn, N. Y., who solved the problem of sectionalizing the footlights; Charles L. Hagen, the technical director of the theatre, who was responsible for the design of the pockets; Patterson Brothers, who did the planning of the electric work; the Western Electric Company, which contracted for the entire electrical wiring and equipment; Edward L. Caldwell and Company, who designed the lighting fixtures.

The theatre is modern French in type, and its harmonious character, both external and internal, can well be judged by the views given herewith. Carrère & Hastings were the architects, and Marc Eidlitz and Son the general contractors.

A Motor Searchlight for Army Use.

The London *Electrical Review* in a recent issue gives some particulars of a new electrical searchlight outfit mounted on an automobile chassis, which has been made by a Paris firm for the French army. The machine, in addition to a thirty-four-inch projector, and the necessary electrical generator, has accommodation for five men, including the driver. It can attain a speed of sixteen miles per hour, and is also adapted to travel across country, for transporting the searchlight.

Chicago Section of the Illuminating Engineering Society.

The March meeting of the Chicago Section of the Illuminating Engineering Society was held on March 15 in the Chicago room of the Great Northern Hotel, where after luncheon a discussion took place on the subject of "The Necessity for Illuminating Engineering in Small Cities." Geo. C. Keech, chairman, presided.

Owing to the unavoidable absence of Mr. Schiebel, who was to have spoken on this subject, the matter was taken up by J. R. Cravath.

Althought the best and worst of engineering might be expected to exist in the city, these extremes, Mr. Cravath stated, are as a general rule, found in smaller towns. The reason for this lies in the fact that the lighting company is responsible for all the engineering practice and if it neglects the opportunities presented, conditions are necessarily very bad. On the other hand, if the lighting company has well informed up-to-date officials and managers, the practice is fully equal to that found in the large cities.

In small stores the old arrangement of lamps generally included a couple of rows of bare incandescents, on the level of the customers' eyes, or several arc lamps hung over the counters. There seemed to be a universal objection on the part of the storekeeper to put his money into reflectors. On the other hand, many lighting companies have induced their customers to install tungsten lamps with proper reflectors, and have designed the entire lighting system to give the best results.

As a whole, the better conditions of lighting in small towns are on the increase, so that it may be said that the lighting of the villages is fully up to the standard of the larger cities.

Mr. Fitzgerald of Gary, Ind., spoke of the attempts that his company had made to secure a better standard of lighting and of the difficulties with which it had met.

On the motion of Mr. Cravath a scheme of providing subject matter for further discussions was adopted. Before the April meeting, plans of some room to be lighted will be sent to each member. Each member who so desires, may then send in a lighting scheme which will be passed on by committee.

Ft. Wayne Electric Lighting Plant Examined.

H. O. Page, an expert electrical accountant of Baltimore, has made an examination and investigation of the municipal light plant at Ft. Wayne, Indiana, and reports that in the year and three months of its operation it has lost $29,000. The largest loss is attributed to commercial lighting. Mr. Page declares that it costs eight cents a kilowatt to manufacture current and the sale of it by the plant at 6.1 cents a kilowatt means a positive loss.

The city officials were not greatly aroused over the report, neither did they deny the deficit. They said nearly every enterprise of like magnitude of this $300,000 plant loses money the first year of its operation. The expert report was made at the instance and expense of the Ft. Wayne & Wabash Valley Traction Company which took exceptions to the city going into the commercial lighting business in opposition to it. The city officials say that they believe the plant is a success and that it has succeeded in reducing the price of commercial lights from ten cents to six cents a kilowatt.

An Unconscious Tribute from the Gas-man.

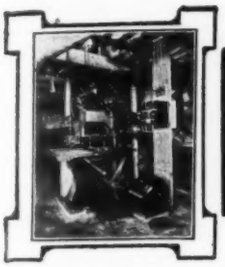
Our contemporary, *The Electric Review* of London, England, prints in a recent issue a paragraph which is so good that it is well worth repeating. The item in question is as follows: "At the recent annual meeting of the Felixstowe Gas Company, the chairman, referring to the lighting of a new pavilion, said 'it was so successfully done that many persons had unconsciously thought it was lighted with electricity.' An 'unconsciously' given testimonial from a Gas chairman!"

India Railway Lights Cars by Electricity.

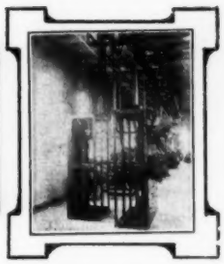
The Madras and Southern Mahratta Railway, one of the prominent roads in southern India, has supplanted gas lighting on its broad-gauge trains in favor of electric lighting.

Copper Exports.

Exports of copper for the week ended March 10 were 2,145 tons. Since March 1 they were 5,898 tons, compared with 7,119 tons the same period last year.



Industrial Power



ELECTRICALLY DRIVEN PUMPS.—XI.

ELECTRIC TRIPLEX PUMPS.

The following interesting article is published by the courtesy of Rumsey & Company, Ltd., Seneca Falls, N. Y., a firm which has done much valuable work in the development of electrical pumping machinery, and the fact that this company manufactures lines of pumps operated by other than electric power, will lend additional weight to the statements in the opening paragraphs:

ELECTRIC TRIPLEX PUMP WITH SILENT CHAIN DRIVE.

The use of electric power for operating machinery is growing with tremendous strides, and information on the subject is of ever-increasing interest to engineers, manufacturers and other consumers of power. "There is a reason," which is perhaps summed up in the word economy. Money saved in turning the wheels of commerce is money made, and this latter is the sole purpose for which business is transacted.

In most cases, electric power can be generated economically, and obviously, when obtainable from water power, which is now being conserved and developed in nearly all sections of the country because of the inevitable, continued advance in the cost of fuel, at a distinct saving over all other forms of power. In addition, we must take into consideration the high efficiency of the apparatus itself in delivering the power; the convenience, cleanliness and ready control of the installation to meet the consumption, and the facility with which the current may be transmitted to the point of application with a minimum of loss.

Having so many evident advantages to its credit, it is not strange that the application of electric power has become so popular and so varied. It has been successfully adapted to drive almost every type of machine that the seemingly inexhaustible ingenuity of the human brain has devised, and in a manner of such readily recognized superiority over the other forms of power as to render it its own best advertising agent.

In the field of pumping, in which nearly every branch of commercial and manufacturing activity is concerned in one or more phases, the employment of electric power as a prime mover is steadily increasing. The demand for electrically-driven pumps is now perhaps even greater than for that of any other type of pump. Especially has the call for electric pumps enjoyed a healthy growth with the utilization of what is known as the triplex pump in a combined and self-contained unit with the electric motor, and for which there is also a reason.

This reason may be briefly stated by again mentioning that word "economy" and considering it in its true sense, and when considered in its true sense it does not necessarily mean low initial cost of the pumping outfit or economy of purchase, but operative economy; for the greatest cost of installing and operating a water plant is the cost of pumping the water itself year in and year out. This after-cost should be, and usually is, carefully weighed when the question of selecting the best type of pump to perform the duty contemplated is being discussed.

It is universally recognized that electric motors are highly efficient pieces of apparatus, and the triplex power pump ranks in the same class as a well-perfected machine, in which the actual power required for operation approaches as near as it is mechanically possible to effect the theoretical power computated. A triplex pump may not be the cheapest kind of a pump to buy, but it proves in service, because of its high efficiency and durable type of construction, a remarkably economical pump to use; and when coupled with an electric motor, the combined efficiency may not be said to be equalled by any other type of pumping unit.

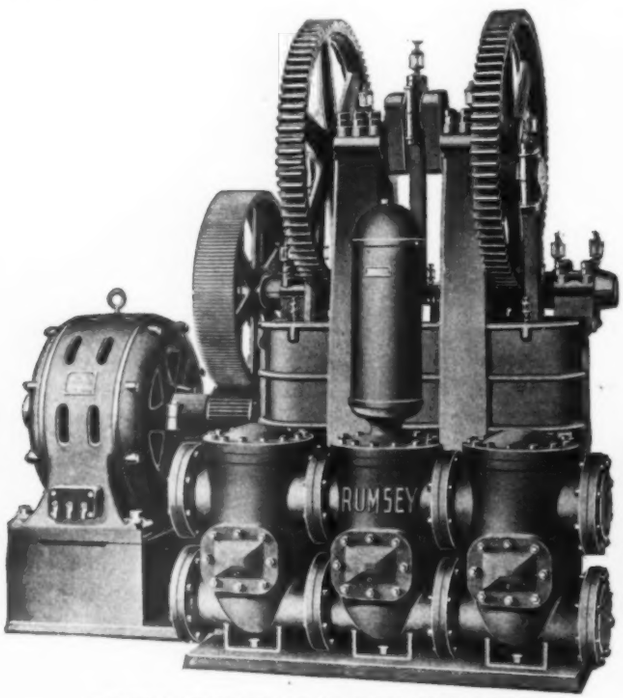
With an electric triplex pumping equipment, a double discount on the cost of maintenance is secured—that from the efficient duty of the motor, and of the pump.

Motor manufacturers claim test efficiencies of from about sixty to ninety per cent, depending on the type and horsepower of the motor; while triplex pumps are said to show from actual tests efficiencies varying from about seventy to eighty-five per cent, which likewise depend on the plunger or piston size of the pump. These efficiencies represent results from operation under full loads. Necessarily, because pumping units of this kind are amenable like all machinery to mechanical laws, the efficiency falls when pumping against lower elevations; but at these lower elevations, they yield correspondingly high efficiencies in comparison with other types of pumping outfits. It can thus be readily appreciated why an electric triplex pump, which need only consume current during actual pumping requirements and can be stopped instantly, is in the long run an exceptionally economical method of supplying water.

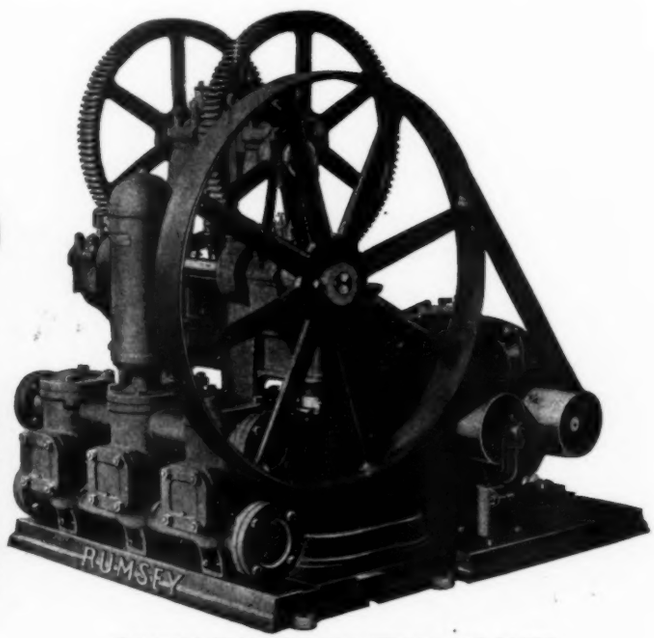
As the name indicates, the triplex pump has three cylinders, in each of which a plunger or piston reciprocates. It is relatively three pumps in one. Both the single and double-acting types are built, the single-acting generally being of the plunger pattern and the double-acting of the piston pattern. These plungers or pistons are actuated by cranks set at 120 degrees apart and turning about a single center, and in consequence follow and overlap each other in travel. A uniform motion results, the expenditure of power is constant, the combined action produces an even strain on the working parts of the mechanism, and the discharge of practically a continuous stream of liquid is secured, the use of an air chamber assisting further in effecting a steady delivery and in eliminating shock. It is apparent that this smooth operation of an electric triplex pump is clearly one of the chief factors that enter into its high efficiency.

The illustrations herewith show three methods of transmitting power from electric motors to triplex pumps and represent types of self-contained outfits manufactured by the firm of Rumsey & Company, Ltd., of Seneca Falls, N. Y. The belt-and-idler method is best adapted to the small and medium sizes and is particularly desirable for installation where a noiseless plant is required, as in apartment houses, office buildings, hotels, etc. The silent-chain drive likewise possesses the advantage of being noiseless and is suitable for all sizes of pumps. Drive by direct-geared connection is a particularly solid method applicable to all sizes and may be rendered quiet with the use of rawhide pinions. For the smaller pumps, cast-iron, bedplates are recommended; while for the larger sizes, both cast-iron and "I" beam bedplates have proven satisfactory.

"Symmetry, simplicity and solidity" are the points claimed to be embodied in the pumps here represented. Details in construction and materials differ somewhat with sizes and styles, particularly in the smaller types, but the main features of design are unique and are incorporated throughout the line. The standards with the crosshead guides and end supports are all cast in one piece with the base, thus insuring perfect alinement and preventing lateral vibration during operation under full load. The crankshaft is of accurately forged steel (or of cast steel in the small pumps), and double gearing, machine-cut from the solid and which equalizes the strain on the shaft, is used, except on the small sizes. The main and pionion shaft bearings are lined with the best babbitt metal, scraped to a true surface. All bearings are, however, bronze-bushed on heavy pressure pumps, ranging up to 8,000 pounds per square inch. The connecting rods are usually of the marine type with adjustable phosphor-bronze boxes



ELECTRIC TRIPLEX PUMP WITH GEAR DRIVE.



ELECTRIC TRIPLEX PUMP WITH BELT DRIVE.

at both ends. The crossheads have adjustable phosphor-bronze shoes, travel in bored guides and are provided with a complete system of lubrication.

Plunger pumps have plungers machined true and ground to to a smooth surface. They are outside guided, outside packed and reciprocate through stuffing boxes of liberal depth. In the case of piston pumps, the crosshead guides are large enough to permit the cylinder head to pass through and allow the piston to be drawn up and repacked without dismantling the pump. The glands have stud adjustment. The valve boxes and cylinders are built with large and direct waterways, which contribute in no small degree to the easy working, high efficiency and long life of a triplex pump. Rubber disk valves are employed, which seat on bronze grid seats, are reinforced by bronze plates and work on bronze guides with cylindrically-wound springs. Metal valves are substituted when the character of the work demands it. All valves have covers which give easy access for inspection and each bearing is equipped with sight feed oil cups for lubrication.

Electric triplex pumps are employed not only for general water supply, but are in service handling nearly every kind of liquid. When the character of the duty demands it, in pumping liquids that corrode iron badly, they may be bronze-fitted throughout. For operating hydraulic riveters, filter presses in oil refineries, sugar refineries, etc., or where heavy pressures are required, they work to excellent advantage because of their steady and uniform action, and as a fire pump they are unexcelled for the same reason.

In connection with running hydraulic elevators, the electric triplex pump may be made entirely automatic in operation and the starting and stopping of the motor between predetermined minimum and maximum pressures controlled by an electric regulator attached to the pressure tank. This same method of automatic control may also be used with closed pressure-tank service for general water supply. Where an open-tank system is installed, a float switch may be employed, which automatically closes and opens the switch between certain desired levels in the tank.

The electric triplex pump is also peculiarly fitted for boiler feeding, when the quantity of water discharged is easily regulated to suit the requirements with the use of a by-pass, consisting of piping from the discharge to the suction and check, relief and gate valves, by means of which the surplus feed water is returned to the source of supply. There is, in fact, scarcely a service, within its capacity for delivery, in the whole range of pumping problems that the electric triplex pump cannot perform with distinction, and it has rapidly won its way in the arena of hydraulic operations as a pump of quality and economy.

(To be continued.)

An Electrically Driven Ash Carrier.

The German correspondent of *The Electrical Engineer*, of London, Eng., writing in a recent issue of that journal, states that an electrically driven ash-carrier is in operation at the works of the Bayerische Brownkohlen-Industrie A.G. at Echwandorf, Germany. There are twenty-six boiler fires maintained with an inferior quality of brown coal, so that the problem of the disposal of the ashes is a very live one. The apparatus under notice does the work of ten men. Iron rakes bring the ashes on to an endless chain belt, where they are slaked with a sprinkler, and carried up into a storage vessel, which can hold thirty cubic metres of ashes, and is at a height of ten metres above the furnaces. The distance is 120 metres. The belt is driven by a fifteen horsepower electric motor, operating normally at 950 revolutions a minute, and capable of yielding nineteen horsepower on starting. If any important obstruction should happen, i. e., if the travel of the belt should be choked in any way, the motor is thrown out of gear automatically, so that there is no injury to any moving mechanism.

The Bactericidal Effect of the Galvanic Current.

It has been frequently pointed out in recent times that bacilli and bacteria are transported from anode to cathode under the influence of the galvanic current and the phenomenon is declared to be a new discovery. At the same time attention is called to the danger of infecting the deeper tissues by ionizing the skin, as in the treatment of tuberculosis of the skin (lupus), and the question is raised, if, in spite of the curing of the lupus, further tuberculous infection may not be caused and on the whole more evil than good be done. To all those who have made an exhaustive study of electrotherapy this "electric germ transmission" will be no novelty, since it is the natural consequence of the fluid-transportation from positive to negative pole, that is, the well-known "cataphoresis". This fact has been demonstrated years ago by various investigators.

Of much greater importance is the question of bactericidal effect of the galvanic current. Already in 1895 Dr. C. E. Schnee, of Karlsbad, pointed out the influence of galvanization on the virulence of bacteria in the treatment of pulmonary tuberculosis, erysipelas and mumps without, however, gaining credence in medical circles. In 1905 Schatzky, of Moscow, demonstrated the correctness of the above assertions by experiments with pure cultures of tuberculosis bacilli, chicken cholera and streptococcus. If bacteria in the interior of the body are thus killed or at least their virulence is greatly diminished, the effect on superficially located germs, as in lupus, must be all the greater. And if any tuberculosis germs should actually enter the blood by cataphoresis, their vitality and virculence will have been decreased to such a degree that they constitute no danger for the deeper, healthier and therefore more resistant tissues. It would be advisable, however, to employ in the treatment of lupus by ionization only weak currents, sufficient to kill the germs, but capable of effecting only a minimum transport of fluid by cataphoresis.—*Abstracted from Elektrotechnische Zeitschrift, Berlin, January 26, 1910.*

An Electrically Operated Gate Valve.

There has recently been installed at the plant of the Pressed Steel Car Company, McKees Rocks, Pa. a forty-eight-inch gate valve—opened and closed by a three-horsepower induction motor—in an exhaust line from a 1,000-kilowatt low-pressure turbo-generator to a condenser. A reduction gear is provided, as the motor operates at a speed of 1,120 revolutions a minute. Hitherto, direct-current motors have usually been employed for operating large gate valves.

A communication has been received from C. Yancey Ligon, Prestonburg, Ky., announcing that he is in the market for an electric plant for coal mines.

MULTIPLE SERIES ARMATURE AND FIELD CONTROL FOR WEB PRINTING PRESSES.

BY S. H. SHARPSTEEN.

A trolley car starts slowly and gradually comes to speed on a grade, or creeps amongst the people and trucks on a crowded street and later runs at twelve or fifteen miles per hour. Starting two motors in series and later connecting them in multiple is the system of controlling generally used.

The starting and running conditions of the trolley car are so similar to that of a web printing press that the same motors and control, with slight changes, can be used on the press. The threading and plating speed might not be as uniform as that now obtained by other methods, but would be much better or more constant than the very low speeds on many web presses now driven by electric motors.

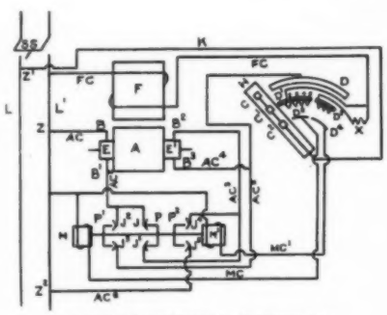
Two railroad motors may be placed under a large printing press and suspended from the driven shaft (or possibly two shafts), similar to the manner in which they are suspended under a car. With this arrangement it would be convenient to drop the motor into a position for quickly removing the armature or field coils in case of a breakdown. The motors, being under the press, would not occupy valuable floor space at the sides and between the presses.

The railway equipments are usually designed for intermittent service in the extreme sense. The web printing press work is also intermittent, but the trolley motor is moving rapidly through the air, when working, which tends to keep its temperature low, while the press motor would be down in a pit where there would not be much opportunity for natural circulation of air. In newspaper plants where the presses run from one-half to one hour each day the usual rating of the railroad motor might answer, but when the presses run for days, sometimes of twenty-four hours each, on book or Sunday newspaper work, the normal rating of the railroad motor would not answer.

With some modification the drum type of controller now used to operate railroad motors in series parallel would answer for web-press drive when used with the standard road motors. The number of armature-controlling points would have to be increased to give a more gradual acceleration of speed, as the printing press will not stand the sudden application of power as will the railroad car and its running gear. With slight additions for operating the press slowly for threading and plating purposes, and for push-button emergency stop, the electric railroad motors and controllers would make a very desirable equipment for a web printing press.

The diagram shown herewith illustrates an excellent plan of using a motor with two windings and two commutators on the armature, with series parallel and shunt field control. This arrangement is especially good where a large range of production speeds is required.

Assume that A is the armature of a twenty-five-horsepower motor geared or belted to a web printing press. When ready to run, the service switch $S\ S$ is closed and the arm H of the controller



SERIES MULTIPLE CONTROL.

moved to the right until controller brush C^1 touches on controller dial D^1, closing the field circuit $F\ C$ and exciting the field magnet F. Next the controller brush C^2 touches dial D^2, passing current through magnet circuit $M\ C$, exciting the magnet M, and closing the switch P in the jaws J and J^1, when current will pass from L^1 at Z through armature wire $A\ C$, brush B, one winding of armature A, brush B^1, armature circuit $A\ C^2$, switch P, armature circuit $A\ C^3$, brush B^2, another winding on armature A, brush B^3, armature wire $A\ C^4$, controller dial D, controller brush C, and back to the line L at Z^1 through the common return wire K. Whereupon the motor armature A will turn at 100 revolutions per minute with full field and the press, geared to the motor at a speed reduction of ten to one, will move slowly at ten revolutions per minute for threading or plating.

When ready for production speed, as the arm H passes on to the right and C^1 passes over the dial points (1, 2, 3 . . .), the field of the motor is weakened until the motor runs at 600 revolutions per minute. At this speed the press will of course run at sixty revolutions per minute. At this point it is necessary to change the armatures from series to multiple, and as C^2 leaves D^2 and touches D^4, current is taken from magnet M and passed through the magnet circuit $M\ C^1$, exciting the magnet M^1, opening the switch P and at the same instant closing the switches P^1 and P^2. Now the current that starts into the wire $A\ C$ from L^1 at Z, passes through the switch P^1 and direct to the dial D through the wire $A\ C^5$, and a new circuit is formed for the second armature winding starting from L^1 at Z^2, passing through $A\ C^6$, the switch P^2, wire $A\ C^3$, the second winding on the armature A, wire $A\ C^4$, to dial D. At the same time the controller brush C^1 leaves dial D^1 and makes contact with the dial D^3, inserting resistance in the shunt field winding at X to cause the armature still to run at 600 revoutions per minute, even though the windings have just been changed over from series to multiple.

Assume that the full field strength was 120 when the start was made and that in order to increase the motor speed from 100 to 600 revolutions per minute the field was reduced from 120 to twenty, or one-sixth of full strength. When the armatures were connected in multiple each one had to produce a counter electromotive force double that of which it did formerly; hence it was necessary to double the field strength; that is, to make it forty. With this field the armatures were turning at 600 and the press at sixty revolutions per minute. As the field strength can be reduced to twenty, it is apparent that the motor speed can be increased to 1,200 and the press to 120 revolutions per minute.

For magazine web presses this range of speed to reach from threading to production would be ample, but is rather low for the web-press practice for newspaper work by the Hoe and Gauss presses.

It might be a better plan to use two separate motor armatures on one shaft with a third bearing in between the armatures, or a very heavy shaft with short armatures instead of one armature and two windings.

If a larger range of speed than can be obtained with two windings or its equivalent must be had, a third armature could be added which would complicate the switching arrangements somewhat and make the motor longer, but these matters are trifling compared to the advantages to be gained. It is probable that a much larger range of field control than six to one could be obtained to enable two armature windings or armatures to meet the demand.

Above twenty-horsepower capacity, a motor of 100 revolutions at full field would be pretty large to run at 1,200 revolutions per minute or higher. Moreover, such a motor would be expensive, hence, these are reasons for using two small motors instead of the larger one. For the very large web presses, two motors of two armatures each, the motors being geared or coupled together, might be the better plan. This should admit of start and change-over from series to multiple without armature resistance, and would make the engineering problem of field control much easier.

The absence of armature resistance, or a very small amount of it, is one novel thing about this plan of control. With the large-size motor equipments it might be found necessary to use one armature resistance point in starting and another at the point of changing from series to parallel, but there are good reasons for believing that there will be systems of web-press drive worked up on this plan in which armature resistance will not be necessary.

The print shop has been very wasteful of current in the past by using armature resistance, but the outlook is that the large range of speed variation required will be obtained without the nuisance of armature control.

As the use of the electric motor has progressed, speed control by means of armature resistance has been a serious problem with insurance inspectors and engineers. From time to time rules have been made to try and keep down the fire hazard from this cause, but now motors can be constructed with a wide range of speed control for pumps, blowers, printing presses and for many other purposes with practically no armature resistance being used, even for starting, where a vey large range of speed control is desired. This will permit the insurance people eventually to eliminate one of the most perplexing problems from their rules governing the installation and use of electrical apparatus, and the print shop will no longer be a receptacle for large cases of resistance to use up valuable space, catch dirt and produce heat.

If separate armatures and fields are used and both armatures placed on one shaft, the electrical and mechanical problems will be easier and the controlling devices could be designed and constructed to use one motor at half maximum production speed in case an armature or field should fail. If four armatures with separate fields were installed, in case of the failure of one armature or field the press could be run at full production speed by operating the three remaining armatures with one-third overload each.

A solenoid switch or contactor could be used to protect the controller at main make and break as described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of April 17, 1909, in the article entitled "Slow-Speed Drive of Single-Motor Web Presses," (p. 698). When manual control is used, emergency stop, no-voltage release, and push-button threading and plating speeds could be obtained, as far as the control is concerned, as described in the same article.

The Plant of the French Cyanide Company.

The Berlin Cyanide Company, which operates under the Frank-Caro patents, has formed sub-companies in foreign countries, and recently the cyanid industry has also been introduced into France. The Société Commerciale de Carbure et de Produits Chimiques has erected an extensive factory on the banks of the Isére, near the village of Notre-Dame de Briancon, alongside of the plant of Metallic Carbide Company. As regards the manufacturing principle, cyanide is produced by subjecting calcium carbide to the influence of nitrogen. The necessary power is furnished by the hydroelectric station of the Metallic Carbide Company, which has a total capacity of 13,000 horsepower. The same company also supplies the calcium carbide, which is reduced to small pieces in a stamping mill and transported to the furnaces by mechanical conveyors. Atmospheric nitrogen is obtained from liquid air produced by Linde apparatus built by the Linde Ice Machine Company, of Munich. The carbide is subjected to the influence of a nitrogen current in cylindrical furnaces, while at a high temperature. The process requires from eighteen to fifty-six hours, and its completion is indicated by the passing of a maximum temperature, after which the furnaces are allowed to cool. Thirty furnaces of a capacity of 300 kilograms of carbide each have been erected. The average production is ten tons a day or more than 3,000 tons a year, but the buildings and machinery have been designed for twice this capacity. The cyanide leaves the furnaces in the form of compact pieces, which are crushed in a stamping mill and finally reduced to powder. An improvement recently introduced consists in granulating the cyanide by mixing the powder with water or tar-oil and transforming the thick paste into granules in a special machine. The product thus obtained is particularly suitable for agricultural purposes. According to Frank, two tons of carbide may be produced per kilowatt-year, and two tons of carbide combine with 500 kilograms of nitrogen. The production of a ton of nitrogen therefore requires two and two-thirds horsepower, or about three horsepower including the energy necessary for grinding and other purposes.—*Abstracted from Elektrotechnischer Anzeiger, Berlin, January 23, 1910.*

Underground Trolley Patents Contested.

The patents for improvements in electric underground trolley railroads were the cause of a suit brought by George D. Burton, of New Ipswich, N. H., against August Belmont and Theodore P. Shonts.

Mr. Burton alleges that his patents were infringed by the New York City Railway Company, of which Mr. Belmont and Mr. Shonts was directors. The Metropolitan Street Railway Company, into which the New York City Railway was merged, is not made a party to the action because of its insolvency, and a judgment for damage against the company would be ineffectual.

Ft. Wayne Electric Works.

The Fort Wayne Electric Works, Ft. Wayne, Ind., has certified to the Secretary of State that its capital has been increased from $1,500,000 to $2,500,000.

TELEGRAPHY—TELEPHONY, and WIRELESS.

RURAL TELEPHONE EQUIPMENT.

BY A. E. DOBBS.

Rural telephone service is a severe test of telephone instruments. Many an instrument that under the supervision of intelligent inspectors will give good service for years, will give unsatisfactory service on farm lines because of some little weakness that the town inspector could fix in a minute's time and think nothing of it.

In a large exchange, the work required of a telephone is generally light and it is under the supervision of trained operators and repair men at all times. If an instrument is reported out of order the inspector calls at the house, takes down the receiver, turns the diaphragm over or cleans the lightning arrester and no more is heard of it for, perhaps, a year or two. If the part cannot be easily repaired at the house he changes it and carries the faulty piece back to the shop where it is fixed up and ready for service again.

The farm telephone is isolated. There is no expert repairman on hand to attend to those little touches that will keep even a poor telephone working. Then again, the work on a country telephone is hard, for when people are not talking to each other, they are almost sure to be listening in, at all hours of the day or night, while curiousity prompts them to open the box at frequent intervals. Indeed, a farm telephone must also be foolproof, if such a thing is possible, for farm lads are anxious to learn all about its construction, and amateurs cannot always leave things the way they find them.

For farm lines there must be supplied a powerful transmitter and sensitive receiver, but the instrument should be durable as well as simple in construction, and some other advantages may be sacrificed to secure these.

Signaling Apparatus. — Generators and ringers have so few changeable parts and are so standardized that, with the exception of an occasional adjustment of the bells or ringer armature, there is little trouble, and when I hear a man complain of his signaling I feel very sure that either his line is in trouble or his bell is out of adjustment. It would seem to be a good thing if ringer armature and bells could be permanently adjusted in relation to each other, although there is quite some difficulty in doing so.

Receivers.—There has been a great advance in the construction of receivers within the last few years. These have become wonderfully sensitive in action, simple in form, and long-lived, but there are sometimes one or two minor faults to be found. In some of them the screws that hold the cord tips in place are screwed into holes drilled in a piece of fiber between the magnet poles. Now while fiber or hard rubber is all right as an insulator, it will not hold a machine permanently without stripping its screw threads. This difficulty can best be overcome by either bushing the holes with a brass threaded lining, into which the screws can be set, or by a metal slug set between the magnets, with the binding screws (insulated by rubber bushings) passing through to a lock nut on the opposite side.

Receivers for this class of service should also be very sensitive, the parts rest in a metal cup with a raised and perfectly surfaced rim on the outer edge to insure free action by the diaphragm, and clamped by a cap that is planed to a perfectly even surface which will give tension enough to insure against buckling.

Transmitters.—The transmitter is not a perfect instrument, and, unless we make some new discovery, it never can be made so, but there are certain mechanical features that make some transmitters more reliable than others. First, I wish some way could be found for getting rid of the old style of dampening springs with their pads of rubber and felt. In warm, moist climates, these soon give out, which renders the transmitter unreliable in action. The same applies to the rubber ring on the outer edge of the diaphragm; it soon becomes sticky and brittle in southern and southwestern climates. They may be all right in exchanges where they are subject to inspection at intervals, but on farm lines they do not seem to work well, and as soon as they begin to go down they go quickly.

Some manufacturers use a German-silver spring for connecting the diaphragm and front button to the insulated tip on the bridge. I have found that this spring tends to warp the diaphragm and it is difficult to replace properly when it is taken off for inspection or repair. This should be replaced by a cable of fine wires that will not interfere with the movements of the diaphragm.

The post at the back electrode, which sets in the center of the bridge, is sometimes so loose that it is warped to one side by its set-screw. This is a trouble that can be remedied in two or three different ways, and manufacturers will some day be compelled to use a different kind of setting for this post, that will wedge and hold itself firmly and vertically in the center of the bridge without warping the carbon chamber in its relation to the diaphragm.

It is also unnecessary to state that in the opinion of the writer the battery cords should pass up through the inside of the arm to the transmitter head and that conductors on the outside of the arm should not be tolerated, or that the arm itself should form no part of the battery circuit, as either of these devices is a troublesome nuisance. Most up-to-date manufacturers, however, have abandoned this form of construction.

The most popular form of box is that commonly known as the "compact" or oblong box, and its popularity is well deserved, for it is simple, sightly and convenient. Where the bell wires or transmitter loop cross the hinges, however, some manufacturers use the

hinges as part of the circuit. This practice should be abandoned as a hinge connection frequently makes trouble.

The practice of fastening the box door with a screw is to be commended.

The carbon arrester on top of the box is generally efficient, but arrester and posts should be carried to the vertical or upright part of the box as people at times lay various articles on the top of the box, from lead pencils to table knives.

Binding posts also need a little attention. These which are simply drilled with a hole in the center and the wire held with a set-screw, should be abandoned, and those of the lock-nut pattern substituted. Many of our best manufacturers already use lock-nut posts, and the rest should follow suit, as they give a better connection to the line wires and do not work loose, as do those of the set-screw type.

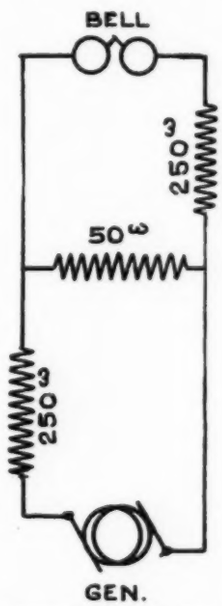
Eavesdropping.—I am convinced that these mutual companies will never take to selective lock-out systems within the next decade at least. Where the town exchange controls the lines they can use the instruments or the system that seems best to them, but the farmers will never purchase them of their own volition.

To prevent the holding up of the line by those who take the receivers off the hooks, condensers in the receiver side of the line have been used a great deal, but they do not seem to be popular with these people, who say that lightning punctures them too easily. Perhaps a graphite or German-silver resistance of, say, 1,000 ohms would be more satisfactory if made up on something like a fuse block, so that it could be easily changed whenever it became necessary to do so.

Bells for these lines should be adjusted to ring through a resistance of 500 ohms with a shunt of fifty ohms across the center. This is a severe test, but is just about what is needed in farm-line service, and bells should be adjusted accordingly.

Pole Switch.—So far as I know there is no pole switch on the market adapted to a telephone line, but such a device is needed on country lines. This switch should be inclosed in an iron cover, mounted on porcelain, and operated by a string on piece of wire from the ground, so that on the approach of a thunderstorm the farmer can cut his line out at the pole next to the house, and afterwards connect it again by pulling the string. If these switches could be made reasonable in price I believe a good live agent could sell 500 a month, for farmers have not yet gotten over the idea that telephone wires "draw lightning," and this is what led to the hooked wire switch (described by the writer in a previous article), which is bad in every way, not only for the single individual, but for others.

In older and more thickly settled communities it is comparatively easy for the exchange to control this class of business and give a superior service, but in the localities of which I have been writing, where the towns are



ADJUSTMENT CIRCUIT.

small and the exchange business unimportant, the country people are in a position to dictate terms to the towns, inasmuch as the town people nearly all own farms somewhere in the neighborhood themselves.

But it strikes me that a telephone embodying all of the suggestions I have made ought to be a pretty good instrument to use in connection with farm lines even where the exchange has entire control. Nearly all of the points suggested above, are to be found in some telephones now on the market. Who will be the first to embody all of them in a single instrument, even if it costs a trifle more, and get the bulk of this trade?

There is a supply house in St. Louis that has a wide trade with these people because word has been passed along from one community to another that the particular telephone they handle is the best that can be obtained. As the supply house in question purchases their own telephones from a well-known manufacturer the moral is obvious.

Long-Distance Telephony in the West.

Long-distance service between eastern Montana points and the rest of the system of the Bell Company was established successfully February 21, says the *Rocky Mountain Bell Telephone News.* The existing gap between Billings and Forsyth was closed by the completion of the new copper circuit of the Montana Eastern Telephone Company, work on which had been prosecuted as rapidly as weather conditions and the receipt of material would permit since last fall.

This connection puts a large and valuable area in direct communication with the rest of the inter-mountain country. The principal points thus made accessible are Huntley, Custer, Forsyth, Rosebud, Miles City, Terry and Glendive, all of which are enjoying local service and have direct connections with the copper long-distance lines, and in addition to the places named many other important localities will have long distance service through locally owned companies with connections at exchange points.

The lower Yellowstone valley has been developing rapidly in recent years and the advent of first-class long-distance telephone service will do much to stimulate its further growth.

The Montana Eastern Telephone company, with general offices at Glendive, has eastern connections that extend to Minneapolis, so that the closing of the gap between Forsyth and Billings means that service may be supplied eastward as far as the carrying power of the human voice on telephone lines will permit.

Wireless on Glidden Tour.

Arrangements are being made for equipping the cars of the 1910 Glidden tour with a wireless telegraph apparatus. As a cosiderable portion of this year's tour extends through territory where telephone and telegraph service is inefficient, this equipment will be of much service in sending out news and reports of accidents.

The Rossi System of Wireless Telegraphy.

A new form of detector for wireless work has been brought out by Professor Rossi, of Turin, a prominent specialist in this field. It operates on a different principle from the usual forms of detector, and is thus of interest from the scientific questions which are involved. At the same time, it has the advantage of being extremely sensitive. Experiments which are quite conclusive, have been made in the laboratory, and Professor Rossi expects to use it on a practical scale in the near future.

The detector is based on the principle of magneto-striction, and this is probably the first time that this phenomenon has been put to a practical use. What is known as Wiedemann's effect is used here, and by this means there is produced a torsional vibration

FIG. 1.

in a fine iron wire, which is stretched between two points.

The principle of the apparatus is a very simple one. A very fine iron wire (0.02 millimetre) is stretched vertically between the supports *AB* (Fig. 1). Parallel to the wire are two bar magnets, represented by the arrows *II*¹, with the two north poles facing inwards near the center, so that the wire is permanently magnetized in two halves, upper and lower, and in the longitudinal sense. In the next place, a current is sent directly through the iron wire, so that it is magnetized in the circular sense, owing to the usual action of the current. Combining this latter effect with the first one, there results a flux in the wire which is represented by the arrows *EE*¹, and the magnetization is now in a spiral or screw form. Owing to the effect of magneto-striction in the wire, such a flux will give the wire a permanent torsion in the direction of the arrow O, or in the same direction as the helical flux gives. When the current in the wire is reversed, keeping the bar magnets the same, the flux due to the current is reversed, and this causes the torsion to take place also in the reverse direction, or from left to right.

Sending an alternating current in the wire will give an alternating torsion effect, with a rapid vibratory movement in the circular sense, which is

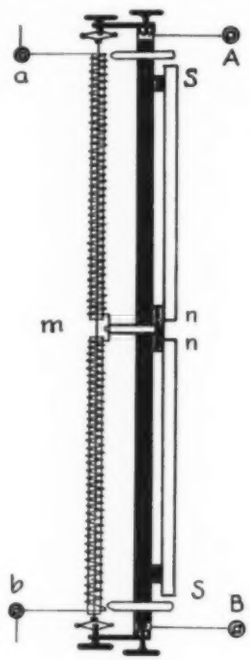


FIG. 2.

made evident by attaching a small mirror at the center of the wire. A beam of light thus reflected on a screen will be spread out on both sides of the center and thus there is seen a line of light representing the amplitude of vibration. Finding the natural period of vibration of the wire, the frequency of the alternating current is then regulated so that it has the same pitch, and in this case the effect in the wire is much increased. Even with a very small current the vibration is great, resulting in a very sensitive instrument, which shows a line of light of considerable length.

In practice the device is mounted as shown in Fig 2. Above and below are two spring stretchers for the iron wire, and curent is sent through the wire by the connections *AB*. Parallel to the wire are the two bar magnets *SN*, *NS*, attached in the rear of an ebonite base. Leading from the poles are the soft iron projections *ee*¹ *f*, which guide the flux near the wire. This latter is stretched in the axis of a two-millimetre glass tube, which is interrupted at the middle to allow for placing the mirror *m*. Around the tube is wrapped a spiral of insulated copper wire, which runs on the two halves of the tube in the inverse sense, and current is sent through the spiral by *a b*.

As before, an alternating current is sent through the iron wire and it gives a line of light on the screen. If now the spiral is placed in the circuit of an antenna, the waves which are received will tend to modify the effect of the bar magnets, and a modification will be apparent in the light beam, as long as the waves last. The effect can be reversed, and the permanent alternating current can be sent through the spiral and the iron wire used to receive the wave im-

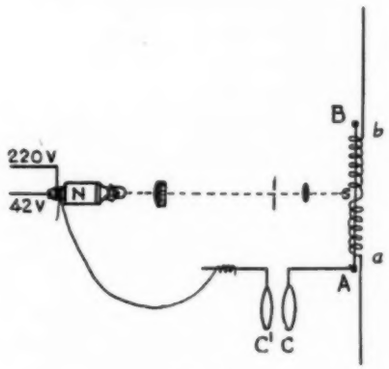


FIG. 3.

pulses from the antenna, the effect being analogous. Waves are thus detected by either method of coupling.

In the laboratory experiment, the ends *a b* of the spiral are connected to two vertical wires so as to form a resonator and insulated from ground, as well as the whole apparatus. The mirror is lighted by a 220-volt Nernst lamp on alternating current at forty-two cycles, and the iron wire is regulated for this period, using the coupling shown in Fig 3. One end of the wire *A* (the other end remaining free) connects with an eight-inch metal disk *C*, which forms a condenser with the second disk *C*¹, which is brought to an alternating potential of thirty-five volts, with respect to the earth, connecting preferably to one side of the Nernst lamp. With *CC*¹, separated by a few inches, the iron wire will vibrate sim-

ply by the charging current of the system *C A B*, giving about an inch width of beam, and this is very constant. Changing the capacity by approaching the hand to one of the antennas, which are connected now to the spiral, alters the beam, and this can be given a movement of three or four beats per second by the hand. Should the antenna be touched the beam suddenly expands, sometimes all over the scale.

One end of the spiral can also be joined to the antenna and the other to ground. As the spiral has a great influence owing to its capacity there can be substituted a metal tube surrounding the glass tube and split longitudinally This metal tube is brought to the alternating potential, and the wire is now placed in the circuit of the antenna. This latter connection forms a very sensitive detector for wireless work, and is the one which Professor Rossi has finally adopted. The wire thus receives periodic currents of high frequency, coming from the waves received by the antenna, and what is noteworthy is that a distant post is able to send out waves, and that the succession of wave impulses or signals can be tuned so that there will have, say

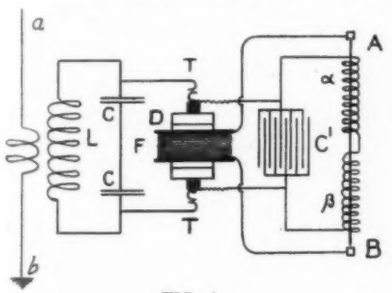


FIG. 4.

forty-two periods per second. This will be in tune with the standard vibration of the detector, so that the effect will be much inceased over what an ordinary wave signal would give. Between two stations there is thus a double method of tuning, namely, the usual high-frequency tuning, and a low-frequency tuning which is quite different from the former and which lies within the usual limits of alternating currents.

Such an instrument does away with many complications and disadvantages of other detectors. At the same time it is not in itself complicated. The use of an outside alternating current can be obviated by using a tuning-fork vibrator to execute the wire (or spiral), and preferably the device shown in Fig. 4, in which the antenna *a b* excites the resonating circuit *L C C*, while the tuning-fork worked by a battery keeps an alternating tension on the wire *AB* by means of the coil *F*, and at the same time closes periodically at *TT*, the circuit of the spiral and the condenser C^1, upon the resonance condenser *C*, discharging thus in a synchronous manner in the circuit C^1 *A B*, the oscillating energy of the circuit to *L C C*.

Professor Rossi states that the exciting alternating current can sometimes be dispensed with, and the instrument simply placed in the circuit of the antenna, provided the wave successions be regulated so as to be in tune with the wire. Signals can thus be read upon the mirror, thus providing a simple and efficient detector. He hopes to be able to generalize this latter use of the instrument in the near future.

Hindrances and Helps to the Propagation of Electric Waves.

Under the above caption *The Electrical Engineer*, of London, England, quotes from an interesting article in the *Elektrotechnische Zeitschrift*, of Berlin, Germany, in which Paul Schwazhaupt calls attention to some very important lessons which can be learned from recent long-distance records in wireless telegraphy, distances ranging from 550 to 1,500 miles. The following is an abbreviated table of the results given by M. Schwazhaupt:

Communication between	On	At p. m	Over a distance of km.
SS. Cap Arcona and Scheveningen	Jan. 10, 1909	8:00	1,600
SS. Bremen and SS. Cap Arcona	Jan. 10, 1909	8:40	1,400
SS. Bremen and Scheveningen	Jan. 5, 1909	9:50	1,280
New Orleans and St. Augustine (Florida)	Dec. 24, 1906	....	900
Guantanamo and Washington	Dec. 24, 1906	....	2,500
SS. Cap Trio and SS. Cap Villano	Mar. 27, 1908	9:10	1,216
SS. Cap Verde and SS. Cap Arcona	Sept. 2,1908	....	1,850

It will be noted that these distances exceed the normal capacities of the apparatus concerned in each case, and were covered at night in every case. There are also some interesting cases of overhearing. In the evening of December, 1908, the ss. Konig Wilhelm II. and the ss. Cap Roca were speaking to each other between Lisbon and Teneriffe, and were about sixty miles apart. For some hours their conversation was heard on the ss. Cap Arcona, then between Southampton and Boulogne, and 2,400 kilometres from the other vessels. On January 14, 1909, the ss. Bremen, when north of the Haaks lightship in the North Sea, heard distinctly not only the messages passing between Marseilles and Algiers, but also between them and American warships coming from Port Said, the average distance being about 2,000 kilometres. These extremely favorable results occur apparently in special places, among which the following have been identified: The Gulf of Lyons, Port Said, the district between Cape Finisterre and Lisbon, the neighborhood of Schevingen and Haaks lightship, and a part of the Atlantic lying in about 10 degrees W. longitude, and 48 degrees W. latitude. No explanation of these remarkable facts is known, but it has been suggested that the electric waves pass most freely over land where metallic ares are abundant. The fact that greater distances are covered at night is probably due to a peculiar condition of the ether after sunset.

As regards hindrances to wireless transmission, they may be divided into geographical and aerial, or practically into mountains and thunderstorms. The intervention of mountains is always attended with great shortening of the distance over which messages can be sent. Naturally, the higher the mountains are and the greater proportion of the distance they cover, the greater their effect. Atmospheric difficulties always begin in the afternoon and reach a maximum at about midnight, and have usually completely disappeared by sunrise. They hence partly neutralize the benefit of the absence of sunlight. They are commonest in tropical climates, and are severe during thunderstorms anywhere. They are especially liable to occur in the neighborhood of mountains, and are common in the Red Sea, and on the coasts of Spain and Italy.

To Tax Postal Company in District of Columbia.

A bill has been introduced in Congress by Representative Smith of Michigan, to provide that on or before August 1 of each year, the Postal Telegraph-Cable Company, is to make affidavit to the board of personal tax assessors for the district, of the amount of its gross receipts for the preceding year, ending June 30, and shall pay a tax of four per cent on such receipts to the collector of taxes.

Telephone Grievances.

The little trouble, says the *Birmingham (England) Evening Despatch*, which the members of the Birmingham Chamber of Commerce, in their corporate capacity, have been having with the National Telephone Company introduces a subject of general interest. The telephone is no longer a scientific toy, or even a luxury. It is a prime necessity of modern life, and we could no more do without it than we could without railway trains. At the same time there is no denying that the telephone is a substantial addition to the worries of life. There is no need to enumerate its disadvantages, save to say that most of them arise from the contrariness of human nature. If we want to bother someone else the telephone is a blessing. If someone else wants to bother us it is a nuisance. Add to this the average man's love of a good grumble, for which the telephone certainly provides in a most liberal measure, and you have the telephone grievances question in a nutshell. The Birmingham Chamber of Commerce has tabulated a most formidable list of complaints, and, on the face of it, the telephone system in Birmingham must be atrocious. There was the incessant cutting off during conversation, the frequent difficulty of getting disconnected, the trouble of getting through to branch exchanges, and, worst of all, the difficulty of getting through to members even when they are not engaged. Well, we have all of use experienced these difficulties in a greater or lesser degree, and they are undoubtedly most annoying. The telephone has probably done more to destroy the temper of the nation than anything within the last century. But here again the fault lies more with ourselves than with the telephone. We want to go too fast. This device by which we can carry on a conversation with a person miles away has ceased to be a wonder to us. We take it all as a matter of course, and we do not appreciate the marvelous improvements which have been made. It is perfection that we want, and if we do not get it we are angry.

The fairer way to look at the matter is this: Ought we not to be profoundly grateful that the telephone system is as good as it is? Think of the amount of work the system does day by day. Think of the time it saves, and the lives it saves. Think of the way it lessens distances, and how it facilitates business, and promotes social intercourse. We must not, accordingly, be in too much of a hurry to see the standard of absolute perfection attained. We do not say that a little grumbling is a bad thing, because it is often a good thing. It keeps the telephone people up to the mark, and has a wholesome influence in bringing about improvements. Granted that the complaints are justified, we do not think for a moment that Birmingham is worse served by the telephone than other towns. One very considerable source of trouble is that the subscriber regards the telephone and all who are connected with it as his natural enemies. The ordinarily courteous man becomes abrupt and overbearing as soon as he get on the telephone. The man who is usually Job-like becomes peevishly impatient when he approaches the instrument. All of us are wonderfully brave in the telephone box. We tell people at the other end of the wire what we think of them in terms much more explicit than we should employ were we speaking to them face to face. And there is another little thing. Every individual subscriber regards the whole telephone system as his own special preserve. Whatever happens to anybody else, he must be attended to immediately, and he invariably regards any difficulties which come in his way as a kind of plot against him upon the part of the telephone company and their servants.

We are afraid, too, that the telephone manner—partly business-like and partly bear-like—is responsible for many little hitches. The telephone system is not purely mechanical. There is a very important cog in the wheel in the shape of the telephone girl. That telephone girl is a human being, and she has weaknesses like the rest of womankind. When she is bullied her bristles go out; when she is coaxed she becomes more tractable. We cannot blame her for paying out the blusterer in the only way at her command. What the subscriber—be he ever so important a person—wants to remember is that the telephone girl is the top dog. If she wants to give you trouble she can, and she always has half a dozen good excuses up her sleeve. Some people, however, never become chastened by this experience. They will stand and fume, and splutter, and threaten, and demand to be put through to the chief operator, wasting altogether about ten minutes, when with a few soft words they could have achieved their end in less than half the time. It is wonderful how little the sense of humor goes into the telephone box, and also how little reasonableness. The telephone may have it defects, but it is the pure cussedness of human nature which is responsible for many of the subscriber's grievances.

Private Wire for Tafts.

A private telephone wire from the house of Charles P. Taft in Cincinnati to the White House in Washington will be supplied soon by the American Telephone and Telegraph Company. The 725 miles of wire will be at the service of Charles P. Taft from 6 p. m. to 6 a. m. No outside hands will manipulate the switchboard plugs, and no outside ear will hear the conversations of the brothers.

William C. Clark, district manager for the long distance interests in Cincinnati, has been instructed to make the arrangements.

The wire, it is said, will cost Mr. Taft $24,000 a year.

American Telephone to Have $500,000,000 Capital.

To meet its growing business, etc., a special meeting of the stockholders of the American Telephone and Telegraph Company will be held March 29 to vote upon the question of authorizing an increase in capital stock from $300,000,000 to $500,000,000, and also to act upon a proposed increase in the number of directors.

It is said that the company does not intend to issue any of the additional stock this year.

The annual meeting will be held on the same day.

The Egner-Holmstrom Telephone.

Recent reports from Sweden state that the long-distance telephone of Egner and Holstrom, which has been in use for some time in the Stockholm's Handels Bank and the Banking House of Warburg, in Hamburg, has been giving most excellent results under continued practice.

Convention of the American Engineering and Maintenance of Way Association.

The eleventh annual convention of the American Railway Engineering Association was held in the Congress Hotel, Chicago, Ill., March 15 to 17. A large number of delegates were present and an interesting programme carried out.

The first regular meeting was called to order by President McNab Tuesday morning, and after delivering his annual address the report of the secretary was called for. This was followed by the reports of the committee on Uniform Rules, Signals and Interlocking, and Electricity.

The Committee on Electricity made no suggestions to the Association in this report owing to the short length of time its work has been in progress.

The various sub-committees, however, have been co-operating with other associations and will be in a position to submit reports soon relative to Clearances, Transmission Lines and Crossings and Electrolysis.

Second Railway Appliance Exhibit.

The second annual exhibition of railway appliances, conducted under the auspices of the Road and Track Supply Association was held in the Coliseum, Chicago, Ill., March 14 to 19.

The exhibits this year were larger and more numerous than those of last and the attendance and interest manifested in the displays indicated that from a financial standpoint the show was undoubtedly a success.

The interior of the Coliseum was tastefully decorated, the ceiling being covered with a mass of flags of all nations. The balconies were decorated with red, white and blue bunting and the booths in green and gold. The centerpiece of the hall was a resting place banked high with ferns and flowers, and around the lower part comfortable benches were arranged. The walls were decorated with artificial flowers.

Illumination was accomplished by means of clusters of six flaming arc lamps suspended from the ceiling. This was augmented by globes enclosing incandescent lamps placed over each booth.

Every appliance used in the construction, maintenance, and operation of railways was on exhibition and it is interesting to note that as a large portion of the space was devoted to electrically operated signals, electrical power is steadily advancing to a predominating position in the operation of railways.

A partial description of the exhibits is given herewith:

The American Railway Signal Company, Cleveland, Ohio, exhibited electric automatic signals; electric switch locks; electric dwarf signals; lower and switch indicators; relays and electric interlocking apparatus. G. L. Weiss, H. M. Abernethy, H. D. Abernethy, J. L. Burrows were in attendance.

American Steel & Wire Company, Chicago, showed right-of-way fencing, rail bonds, triangle mesh concrete reinforcement, nails and wire, electrical wires, W. & M. telephone wire. The company was represented by J. M. Holoway, L. P. Shanahan, H. A. Parks, B. H. Rider, H. S. Durant, R. C. Moeller, C. S. Knight.

W. E. Bossert Manufacturing Company, Utica, N. Y., exhibited triplelock switch stand, Bossert insulated rail joint, Bossert improved switch point adjuster, the Nickerson safety switch point lock, tie plate and guard rail clamp, semaphore blade claps, Reliance spike braces. Represented by F. L. Guillaume, Utica, N. Y., H. C. Williams, Utica, N. Y., and Willis C. Squire, Fred G. Squire, Western Union Bldg., Chicago, Ill.

The Central Electric Company, Chicago, Ill., had on exhibition a complete line of Okonite wires and cables; Okonite and Manson tape; Candee pot-heads and samples of crude rubber. An interesting feature of the exhibit was a portion of Okonite submarine cable that had been badly knotted by a propeller of a tug boat without affecting its insulation. J. M. Lorence, D. J. Goff, M. Cox, W. D. Dunsmore and D. M. Ayers of the Central Electric Company and Lewis G. Martin and F. J. White of the Okonite Company, New York, were in attendance.

Detroit Hoist and Machine Company, Detroit, Mich., showed pneumatic and electric locomotive turn-table tractors. J. C. Fleming, president, and F. B. Fleming, sales manager, were in attendance.

Joseph Dixon Crucible Company, Jersey City, N. J., exhibited graphite paint; lubricating graphite crucibles; graphite and plumbago. Represented by E. R. Smith, 1324 Monadnock Block, Chicago.

Duplex Metals Company, New York city, showed a miniature representation of sleet and snowstorm, showing imperviousness of copper-clad wire to storm. Also a testing machine which was in operation to show tensile strength of copper-clad steel wire. Represented by Frank R. Chamber, Jr., vice-president, and James F. Kinder, secretary.

Edison Manufacturing Company, Orang , N. J., and Chicago, Ill., had on exhibition B. S. C. O. and Edison primary batteries for signal work; automatic block signals and crossing bells. Represented by E. E. Hudson, manager of sales; F. J. Lepreau, and E. W. Brown.

Electric Storage Battery Company, Philadelphia, Pa., showed "Chloride Accumulator" batteries for drawbridge operation and "Chloride," "Tudor" and "Exide" types for carlighting, signal, interlocking and automatic block signal work, also ET. couple types for small lighting plants and telegraph service. G. H. Atkin, manager; T. Milton, district engineer; R. V. Baird and T. A. Cressey, salesmen, were in attendance.

Fairbanks, Morse & Company, 481 Wabash Avenue, Chicago, showed a line of motor cars, standpipes, pumping machinery, dynamos, drills, scales, etc. Represented by A. A. Taylor, C. W. Kelly, R. E. Derby, L. H. Matthews, F. M. Condit, F. H. Clarke, C. D. Walworth, R. D. Head, F. F. French, F. E. Church, H. C. McClary, S. F. Forbes, all of Chicago; J. G. Jones, New Orleans, La.; J. A. Steele, Norfolk, Va.; E. M. Fisher, Detroit, Mich.; L. Norvell, F. B. Roy, A. F. Young, all of St. Louis, Mo.; H. D. Smith, St. Paul, Minn.; A. C. Dodge and F. H. Douglas, of New York.

General Railway Signal Company, Rochester, N. Y., Chicago and New York city, showed a number of all electric interlocking machines, electric switch movements, various types of power signals, automatic signals, manual control signals, relays and other such devices. Represented by W. W. Salmon, L. Thomas, W. K. Howe, George D. Morgan, F. L. Dodgson, M. R. Briney, J. L. Langdon, H. M. Sperry, G. H. Macdonough, W. R. Young, F. H. Jones, and P. Van Pelt.

Grip Nut Company, Chicago, showed grip nuts, special grip holding nuts. Represented by E. R. Hibbard, Herbert Green, B. L. McClellan, W. G. Wilcoxson, B. C. Wilt, R. A. Flum, B. J. Bernhard and J. W. Hibbard.

The Hall Signal Company, New York and Chicago, showed railway signals and accessories. Represented by W. J. Gillingham, Jr., resident manager, and W. H. Lane, chief engineer.

H. W. Johns-Manville Company, New York, showed a line of asbestos and magnesia materials, electrical supplies, roofings, and smoke jacks. Represented by J. E. Meek, J. C. Younglove, F. M. Gilmore, C. E. Murphy, H. A. Waldron, J. M. Trent, P. C. Jacobs, G. W. Risteen, Jr., R. A. Hamaker, and H. G. Newman.

Kerite Insulated Wire and Cable Company, New York city, exhibited a full line of "Kerite" insulated wires and cables. Represented by R. D. Brixey, president; Azel Ames, P. W. Miller, and J. A. Renton. Western representatives, Watson Insulated Wire Company, Chicago, Ill.; J. V. Watson, B. L. Winchell, Jr., R. A. Paterson, E. B. Price.

W. N. Matthews & Brother, 219 North Second Street, St. Louis, Mo., showed Matthews guy anchors, telephone-jack boxes and plugs for dispatching systems, cable-clamps, cable-splicing joints, lamp guards, and other money-saving specialties. Represented by Clause L. Matthews, W. N. Matthews, Victor L. Crawford, and Walter E. Bishell.

National Electric Specialty Company, Toledo, Ohio, showed a complete line of lighting arresters and self-soldering wire joints. The V-A-C arrester was shown in actual operation. The company was represented by Dr. Chapman.

The Rail Joint Company, 2 West Thirty-fourth street, New York, N. Y., showed continuous, Weber and Wolhaupter types, base supporting rail joints. Represented by V. C. Armstrong, L. E. Braine, W. C. Clark, J. A. Greer, Percy Holbrook, H. C. Holloway, J. G. Miller, F. A. Poor, E. L. Vandresar, B. Wolhaupter, and F. C. Webb.

Standard Asphalt and Rubber Company, 205 La Salle Street, Chicago, showed a line of Sarco products and Sarco methods for waterproofing concrete surfaces. Represented by W. H. Lawrence.

Union Switch and Signal Company, Swissvale, Pa., showed interlocking and signaling apparatus for steam and electric railways, including electro-pneumatic and electric interlockings in operation; signals; relays and other apparatus for alternating-current or direct-current automatic block signaling; staff system and other controlled manual apparatus; electric crossing gates and bells; Keystone insulated rail joints; mechanical interlocking details, etc. Represented by H. G. Prout, J. G. Schreuder, J. S. Hobson, S. G. Johnson, J. P. Coleman, M. D. Hanlon, L. F. Howard, T. H. Patenall, W. H. Cadawallader, J. D. Taylor, H. McCready, W. E. Foster, George Blackmore, W. M. Vandersluis, and C. C. White.

Yale & Towne Manufacturing Company, Stamford, Conn., showed a complete line of blocks.

INDUSTRIAL SECTION

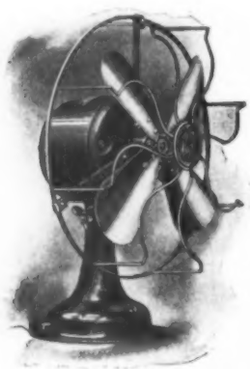
ILLUSTRATED DESCRIPTIONS OF NEW AND STANDARD ELECTRICAL AND MECHANICAL APPARATUS

"Tuerk" and "HE" Fan Motors.

The Hunter Electric Company, with a factory at Fulton, N. Y., and general offices at 253 Broadway, New York city, is producing a fine line of electric fans for the season of 1910. These comprise a complete assortment of ceiling, floor and counter column, desk, bracket, oscillating and ventilating fan motors, both for direct and alternating current, and designed to meet all conditions, frequencies and voltages.

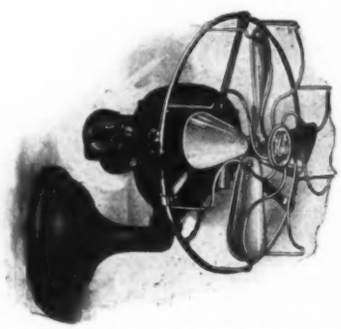
For the 1910 season the Hunter Company has brought out an entirely new type of alternating-current floor and counter-column fan, as well as eight-inch alternating and direct-current desk fans, in accordance with its policy of keeping abreast of the times by providing a type of fan for every conceivable use and application. Descriptions follow of some of the principle "Tuerk" and "HE" fan motors manufactured by this company. Illustrations are given of the type described.

The "Tuerk" type "C" alternating-current ceiling fan, shown herewith with electrolier attachment, has a slow-speed induction motor and is supplied with four blades only, the blades being



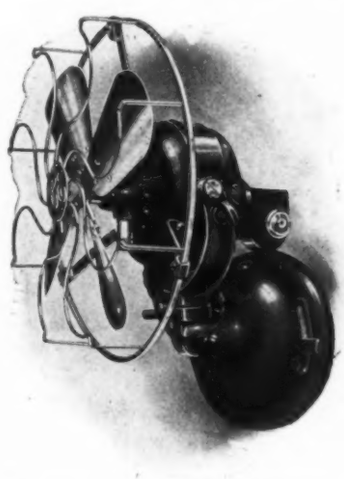
"HE" TYPE "Q" EIGHT-INCH ALTERNATING-CURRENT DESK-AND-BRACKET FAN, USED AS DESK FAN.

permanently fixed at a correct angle to the rotor of the motor. The blades are six and one-half inches wide at the tip and have a fifty-two-inch sweep. The motor is particularly adapted to frequencies of twenty-five, forty, fifty and sixty cycles. The bottom of the motor case is drilled and tapped to standard thread for the attachment of an electrolier of two or four lights, all fans of this type being wired for electrolier attachments. The fan is furnished complete with two-speed regulating switch, ceiling hook, canopy, and insulated hanger.



"HE" TYPE "I" ALTERNATING-CURRENT TWELVE-INCH SWIVEL-AND-TRUNNION FAN MOTOR, USED AS BRACKET FAN.

Stems can also be supplied if desired. The standard finish is japan with oxidized copper trimmings. A white enamel finish with gold lines may be

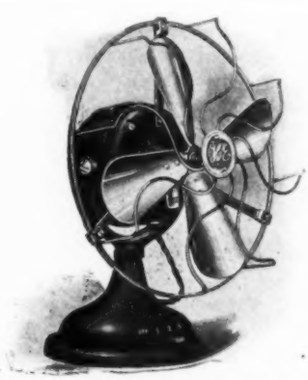


"HE" TYPE "T" DIRECT-CURRENT, SIXTEEN-INCH, OSCILLATING, DESK-AND-BRACKET FAN, USED AS BRACKET FAN.

substituted for this at a slightly higher price.

The construction of the motor for the type "C" fan calls for more than passing mention. The field or stator of the motor consists of sixteen distinctive poles with a corresponding number of poles on the rotor. The high efficiency obtained in the type "C" construction is largely increased on account of the close proximity of the rotor to the field, thus reducing the air gap to less than one-hundredth of an inch. This is made possible on account of the long bearing surface of the rotor whereby the chance of getting out of alignment is reduced to a minimum. All parts are inclosed inside of the iron shield, including the speed regulator or reactance coil, which is fed to the regulating switch by means of a hollow shaft. The starting and regulating switch is imbedded into the bottom frame, so that the motor, for the purpose of installing, can be placed substantially on a bench by simply removing the switch button and in that way not injure the switch mechanism. Each coil is tested at every point and the rotor is started up by a remote switch; this does away with extra starting torque and it is claimed that the consumption of current is thereby made less than in other types of ceiling-fan motors. No adjustment is necessary, and the operation of connecting up is simple in the extreme.

The "HE" type "I" oscillating fan



"HE" TYPE "S" TWELVE-INCH, DIRECT-CURRENT FAN MOTOR, DESK-AND-BRACKET TYPE, USED AS DESK FAN.

is especially designed for frequencies of from twenty-five to 133 cycles, and voltage from 100 to 220, and is equipped with four polished brass blades twelve inches and sixteen inches in diameter, together with an ornamental polished brass guard of corresponding size. The

type "J" motor is mounted on a symmetrically designed base and swung in an adjustable swivel-and-trunnion frame. The desk type can be easily converted for use as wall bracket by simply changing two screws holding the trunnion to the base, no angle adapter being necessary. The fans are equipped with a four-point regulating switch, which provides three running speeds. The motors can be operated over a range of frequency and voltage of seven and one-half per cent either above or below normal. The oscillating action is accomplished through gears direct-connected to the rotor shaft. The range of oscillation is adjustable, and this fan can also be run as a straight desk or bracket fan if desired.

The "HE" type of "Q" eight-inch convertible wall-bracket fans are designed for frequencies from twenty-five to sixty cycles, and voltages from 100 to 220, and are equipped with four polished brass blades, eight inches in diameter, together with an ornamental polished brass guard of corresponding size. The motor is of high-speed induction type. The body and base of the fan are made from drawn sheet steel, highly polished and finished in dark gun metal. By the use of the drawn-steel frames, the weight of the motor is greatly reduced, being approximately four and three-fourths pounds completely equipped. The adjustable screw at the base makes it easily convertible for use as a desk or wall-bracket type. These fans are equipped with a four-point regulating switch which provides for three running speeds.

The "HE" type "S" fans are designed for voltages ranging from 100 to 230, and are equipped with four polished brass blades twelve inches and sixteen inches in diameter, together with an ornamental polished brass guard of corresponding size. The motor is of the ironclad type. The armatures are machine-wound with silk-insulated wire, and have commutators of hard-drawn copper bars, which are insulated with mica. The motors are supported on a substantial, symmetrically designed base, and swung in an adjustable swivel-and-trunnion frame. The desk type can be easily converted to a wall bracket by the use of an adapter, which will be supplied without extra charge if ordered with fan. They are equipped with a four-point regulating switch, which provides three running speeds. The motors can be operated satisfactorily over a range of voltage of ten per cent, either above or below normal. The body of the motor is finished in highly polished black japan, and the oil cups and other trimmings in polished brass.

The "HE" type "T" oscillating fan is designed for voltages from 100 to 220 volts, and is equipped with four polished brass blades twelve inches and sixteen inches in diameter, together with ornamental polished brass guard of corresponding size. The motor is of the ironclad type and is supported on a substantial symmetrically designed base, swung in an adjustable swivel-and-trunnion frame. The desk type can easily be converted for use as wall bracket by changing two screws in the base, no angle adapter being necessary. The fans are equipped with a four-point regulating switch which provides three running speeds. The motors can be operated satisfactorily within a range of ten per cent, above or below normal. The oscillating action is derived through gears direct-connected to the armature shaft. The action is simple and positive and the range of oscillation is adjustable. The fan can also be run as stationary desk or bracket, as desired, and can also be operated in any position.

"TUERK" TYPE "C" ALTERNATING-CURRENT CEILING FAN, WITH ELECTROLIER ATTACHMENT.

"ECK HURRICANE" DIRECT-CURRENT OSCILLATING FAN.

"Eck Hurricane" Fan Motors.

The Eck Dynamo and Motor Company, Belleville, N. J., with offices and stockrooms at 19 Murray Street, New York city, is putting out a line of "Eck Hurricane" direct-current fans for 1910, which possess some commendable features.

The "Eck Hurricane" oscillating fans are made in twelve and sixteen-inch sizes for direct current not exceeding 250 volts pressure. These fans are designed for use in stores, restaurants, hotels, offices, factories, theatres and dwellings, and are practically noiseless in operation. The time and length of

operation are positively regulated and the fans oscillate equally well whether level or tipped forward, at any or all of the three speeds provided, in all positions, or within wide or narrow limits.

The oscillating feature is a worm gear submerged in grease. As an additional precaution a friction disk is used in the gear wheel so that if the fan is prevented from oscillating by any cause the gears will not be subjected to an extraordinary strain. By the use of the positive gear, it may be noted, there is no obstruction to the air current as is the case when wind-operated oscillating means are used. Of course, there is a certain amount of extra power consumed by the oscillating mechanism, but this is small in amount and adds very little to the current consumed by the fan.

"ECK HURRICANE" OSCILLATING FAN.

Siemens Fire Alarm Systems.

For medium and small sized cities and for large industrial plants, the Siemens fire alarm system has proven effective and reliable.

In the accompanying illustrations are shown views of the principal apparatus used in one of these systems. The clockwork of the alarm boxes, shown in Fig. 1 is mounted on a cast-iron plate, placed in a small case and made absolutely waterproof. Inside the same box, in addition to the clockwork is a lightning protector and contact key. In the front door is a push button, protected by a thin glass pane. In order to reduce misuse as much as possible a loud ringing mechanical vibrating bell is installed in the door of the box. To send an alarm, the glass is broken and the button pressed which releases both the alarm mechanism and that of the warning bell.

At the central station the switchboard shown in Fig. 3 is installed. This board is equipped with a magneto, indicator apparatus, lightning protectors and alarm bells. When an alarm has been sent the signal annunciator disc on the board moves and remains stationary at the number of the sending box. At the same time an alarm bell rings and continues ringing until the annunciator disc is raised and the pointer brought back to the original position. The operator then, by means of the hand magneto rings the various bells installed in the homes of the firemen.

The cells necessary for operating the system are also placed at the central station. For generating direct current

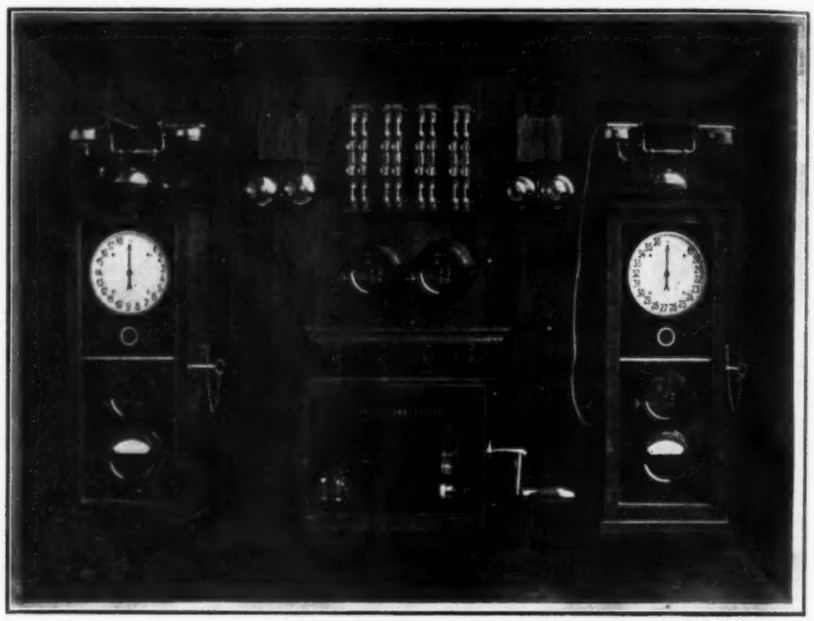


FIG. 3.—SIEMENS CENTRAL-STATION EQUIPMENT FOR FIRE ALARM SYSTEM.

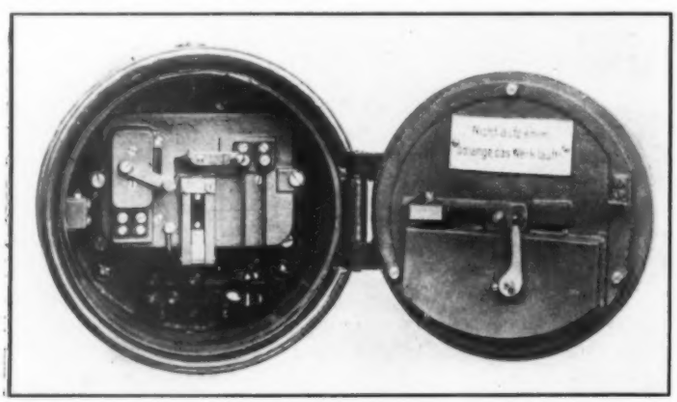


FIG. 1.—SIEMENS FIRE ALARM BOX OPEN.

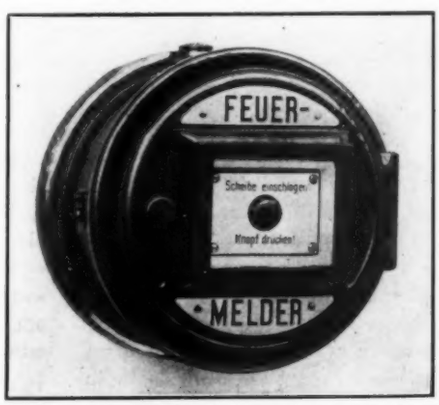


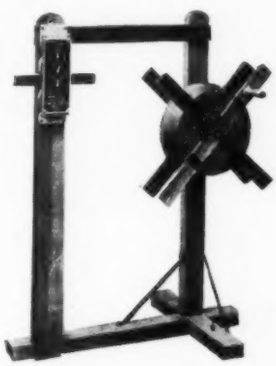
FIG. 2.—EXTERIOR OF FIRE ALARM BOX.

in the box circuit, closed circuit cells are used, these having an electrolyte of copper sulphate; they are rechanged about two or three times each year. For controlling the battery, an ammeter is provided in the indicator apparatus, which shows the current flowing through the line. In the local or annunciator circuit, ordinary Leclanche or dry cells are used.

Combined Wire Reel and Meter.

A most efficient device for measuring and reeling wire and cordage of various sizes is shown in the accompanying illustration. This machine which is manufactured by the Minneapolis Electric and Construction Company, Minneapolis, Minn., while simple in construction is durable and rigidly built to stand the wear and tear of rough usage.

In the meter the wire passes between



COMBINED WIRE REEL AND METER.

two self-adjusting rollers, which admit of wide range, and will measure accurately large or small sizes. The pointers are movable and readily adjusted to the zero point.

The reel is provided with removable cross bars, and the drum with grooves so the coil can be bound with tie wires and removed in a compact form. The meter shows the number of feet in the coil and eliminates the inconvenience of measuring on the floor.

The device being movable, and occupying small space, can be placed where convenient for measuring and set aside when not in use.

An autographic electric fever recorder, based on the principle that the electrical resistance of platinum varies with its temperature, has recently been introduced by a leading electrical company in Germany.

Crawford Cedar Company Expands.

In the accompanying illustration is shown the latest acquisition of the Crawford Cedar Pole Company, at Menominee, Mich., this immense yard having recently been purchased from Raber & Watson, who were prominently identified with the telephone in-

YARD OF CRAWFORD CEDAR COMPANY, MENOMINEE, MICH.

dustry as extensive producers of poles.

Menominee, Mich., has for many years been conspicuous as a center of operations in the cedar pole industry and in thus succeeding Raber & Watson, the Crawford Cedar Company will have available from 70,000 to 100,000 poles for fall and spring trade. The new firm also has extensive timber holdings elsewhere, being one of the largest operators in the northern peninsula of Michigan.

Another interesting feature of the deal is the fact that Wm. S. Patch, who was a long time identified with Raber & Watson, in charge of their telephone pole department, becomes manager of the Crawford Cedar Company.

Murray Water-Tube Boilers.

The increased demand for a high-pressure steam boiler capable of economically converting water into steam has led to the almost general adoption of water-tube boilers.

In this connection the Murray water-tube boiler may be mentioned as embodying the three essential points in design and construction necessary in every successful boiler, namely, freedom from danger of explosion, accessibility to facilitate cleaning and simplicity in form, thereby allowing repairs to be easily made.

The Murray boiler, shown in the accompanying illustration, is of the round drum, straight tube type, and consists of one or two top drums with front and rear headers all entirely constructed of boiler plate, with a number of wrought tubes connecting the headers. The drums and tubes are inclined to the rear.

MURRAY WATER-TUBE BOILER.

The headers are of the rectangular box form of ample size to allow the rapid circulation of water from the

drum to the tubes and the tubes to the drum. In the uptake where the headers connect to the drum a number of small oblong openings, of ample area for free circulation are made.

Each tube is provided with an oval forged steel hand-hole plate that may be removed through its own hole, and a gasket, bolt and crab is provided to enable the attendant to easily remove these plates and clean the boiler, and to easily and quickly replace them.

Man-holes are provided to enable the attendant to enter the drums for inspection, cleaning or repairs. The fronts are of neat and practical design, the upper part ornamental and pleasing to the eye, with the lower part solid and heavy to withstand the heat and with an ample number of doors to facilitate firing. The grates are of the improved rocking type.

New Western Electric Mine Telephones.

The prevention of loss of life from fires in mines has become imperative. The most practical safeguarding measure, that has been advanced by authorities on the subject, is claimed to be a systematic use of the telephone. The usefulness of telephones in mines is by no means a new subject for discussion. Many mines already have working telephone systems both above and below ground, and it facilitates their business as well as provides a means of safety in case of accident.

FIG. 1.—MINING SET CLOSED.

The accompanying illustrations show two new designs of mine telephones recently completed by the Western Electric Company. The work of bringing this new type of apparatus into its final form has been under way during the past eighteen months, although the development and reconstruction has covered a period of several years of close co-operation with mine operators and officials, with the idea of making the new design cover all the requirements of mining service.

The illustrations in Figures 1, 2 and 3 show three views of what is known as No. 336-E metal type mining set. Figure 4 shows No. 337-E, a specially treated wooden type set, having the same general features of operation and

FIG. 2.—MINING SET OPEN.

arrangement of parts as the apparatus of the metal sets. Both types of telephone sets are very compact and attractively designed. All of the apparatus inside of the cases is arranged for accessibility and at the same time carefully protected against corrosion due to acid fumes, gases and moisture.

All of the parts which for any reason need to be removed can be easily taken out of the sets without the aid of a

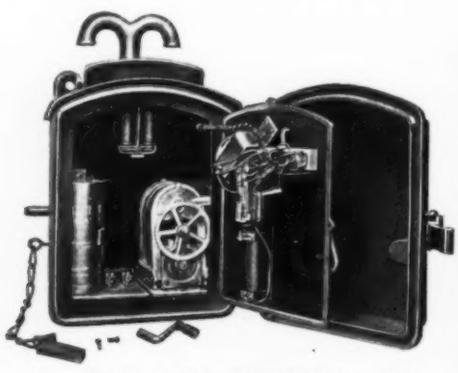


FIG. 3.—SET SHOWING MECHANISM.

soldering iron, as all the connections are made with suitable screws. Although it is not necessary to get into the working parts of the apparatus except for changes to the system, this feature makes the system available for inspection at any time.

The top of the metal set is curved, and the wooden set is provided with a gable roof, so that any foreign articles or water falling on either of them will readily slip or run off.

The line wires to the sets may be brought in either at the top of the box or at the bottom. When brought in at the top the curved connector shown at the top of the box in Figure 1 is used. This connector, it will be noted, prevents moisture or water from running into the set when the wires are led into the top of it. It will be readily seen that as the wires come down to the set and make the turn into the curved connector any moisture or water will drop from this point and not follow the wire into the apparatus.

When the line wires are brought in from the bottom, it is not necessary to use the curved connector and the opening for it at the top of the set is closed by a suitable plug provided for the purpose.

The gongs are especially designed to give a loud, clear ring which can be heard a long distance in the mines. As seen in the illustrations these gongs are protected by a hood, making it impossible for large particles of foreign matter to fall on them or interfere with with their action.

Allis-Chalmers Company.

The Allis-Chalmers Company reports a good run of business in February. In that month the new orders received in the New York district were the largest reported in any month since 1902. As has been the case with the electric companies, orders have been confined largely to small contracts. While the volume of business has not been at a high record, the electric companies have more customers on their books than they have ever had before.

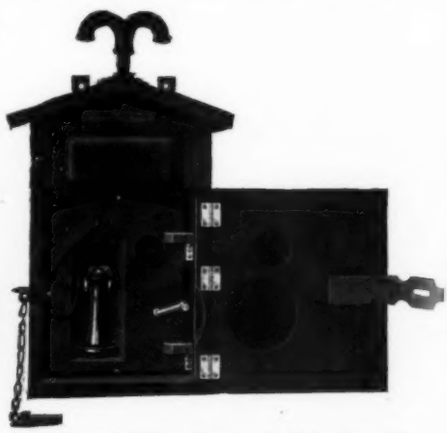


FIG. 4.—MINING SET IN WOODEN CASE.

The Allis-Chalmers Company is employing more men than at any time in years, but its production is not up to capacity, which has been largely increased over the last several years.

Current Electrical News

GREAT BRITAIN.

(Special Correspondence.)

LONDON, MARCH 5, 1910.—After many years of keen competition, the electric supply authorities in London, and the surrounding districts, are, thanks to an Act of Parliament, passed in 1908, now able to adopt a policy of co-operation, and the first results are now to be seen. Starting with the one general principle that they all desire to sell as much electricity as possible, a Joint Publicity Committee has been formed, consisting of representatives of companies and municipalities. This committee will—indeed it has already commenced work—prepare publicity matter of various kinds, including large colored posters, pamphlets, etc., which will be produced in large quantities and consequently very cheaply. This will be so arranged that each undertaking may stamp upon it particulars of itself for distribution in its own area of supply. Hitherto, each undertaking has worked upon independent and often very narrow lines on this question of publicity, but the new scheme will proceed on the broadest possible lines, and should undoubtedly result in a far more effective publicity than has been possible in the past. The action taken hitherto has been in no way the fault of the companies and local authorities, for until the beginning of 1909 they were forbidden by Act of Parliament to associate with each other for any purpose whatever, each supply area having been constituted a kind of watertight compartment.

The Kearney high-speed Electric-railway system has been before the public in England for a year or two, in model form. The cars run on a single rail with an overhead guard rail, and exceptional speeds are claimed for it, reaching to something like 120 miles per hour. It is now announced that Parliamentary powers will be sought for constructing a railway upon this principle from the city to the Crystal Palace, partly in the tunnel and partly on the surface. The promoters claim that the cost of construction is only $1,250,000 per mile, and if this can be done there is a very marked difference between the cost of the new system and that of constructing underground railways on systems similar to those now in existence in London .

Despite the fact that in the one square mile which constitutes the City of London, there are to be found specimens of every conceivable method of street lighting, the City of London has sanctioned still further experiments between the electric lighting and gas companies.

Following on a tendency in this direction in Germany, English sellers of metal-filament lamps are beginning to reduce their prices of metal-filament lamps, when the supply of metal-filament lamps is not up to the demand, there seems little justification for such a policy. While many large firms are crying out for a change in our fiscal system as a means of receiving better prices, etc., it sounds rather odd to hear of such an action under present conditions.

The Hull Corporation is very proud of the fact that a profit of about $5,000 has been made on its municipal telephone service for last year, although nothing is said about any provision for depreciation. This mild result has once more led to a cry for municipal telephones, but the Hull Corporation may rest assured that when its present license expires, the undertaking will be absorbed by the Postoffice and worked with the remainder of the national system. Hull and Portsmouth are the only two municipalities working telephone systems. In Glasgow, where the agitator for municipal telephones originated, but where the municipal undertaking was sold to the Government after a few years, a system of co-operation between the National Telephone Company and the Post-office systems has been recently inaugurated. No active competition will take place in future in procuring new subscribers. The Post-office will do all the canvassing until the National Company is acquired in 1911. G.

CONTINENTAL EUROPE.

(Special Correspondence.)

PARIS, MARCH 4.—An electric railroad line which has been running very successfully in Austria in the Trient-Malé railroad. It lies in the Tyrol region and is now carrying a considerable amount of traffic. The total length of the line is about forty miles. Starting from Trient, it follows along the Etsch River and runs parallel to the South Austrian railroad, crossing this latter at San Mitchel. After traversing the picturesque valley of the Nonstal by way of Vigo and Dermulo, it then reaches the Sulz Valley and terminates at the town of Malé. Current is brought to the line at 20,000 volts from a hydraulic plant which has been erected in the neighborhood of Trient, and known as the Sarca plant. The high tension lines feed three substations at the ends and the middle point of the electric railroad, and the rotary groups in these stations supply 800 volts for the line. A double truck car is used here, provided with bow trolley and fitted with four 750-volt motors of fifty horsepower size.

The municipality of Dordrecht, Holland, is considering a project for the construction of an electric plant of large output.

Among the recent French companies I note the Ch. Lefebre Company which has been formed at Paris for the installation of tramways and electric railroads. At Nancy, the Energie-Eclairage firm is to be engaged in securing concessions for electric and gas enterprises. The Pas de Calais Electric Company is formed at Douai for various electrical work.

At Nice, France, the municipality recently voted the funds for the electric ligthing of the port. There is a project on foot for an electric traction line between Valence and St. Precay. In the Calvados district, in the north of France, measures are being taken for building an electric road from St. Laurent to Port. The electric lighting of Ibertville is being considered by the municipal council. The lighting mains are increased at Cherbourg and the existing contract for gas and electric supply is extended by a recent decision for a period of eighteen years.

The work on the Lötschberg tunnel in Switzerland is being actively carried on at present. It will be remembered that it is built from the start for a double track electric railroad. At the north end of the tunnel at Kandersteg the electric plant now furnishes 1065 horsepower for driving air compressors for the drills, and also for electric lighting and motors. The plant at the south end at Goppenstein is supplying 1600 horsepower for the same purpose.

There is a project in evolution for erecting a hydraulic plant on the Durance River, and it will rank among the largest in France. On the same stream there have been already built the Ventaron and the Brillanne hydraulic plants, which form part of the network of station and lines controlled by the Energie Electrique Company. The new turbine station on the Durance is expected to give an output of 60,000 horsepower. According to the present plans, the course of the river is to be regularized so as to provide for an extensive irrigation scheme as well as for the hydraulic work of the turbine plant. An artificial lake will be situated near the locality of Serre-Poncon, this being formed by a dam of 270 feet in length. The cost of the dam is estimated at $7,000,000.

The French navy department is taking measures to install wireless telephone outfits upon two of the warships of the fleet, this being a preliminary step towards using it upon all the warships as well as upon other vessels.

Among the new projects in Spain I note the new electric tramway line which is to be built in the city of Barcelona. It will run principally in the northeastern part of town, ending at the quarter of Vallcara. A suburban traction line is also to be constructed from Cadiz to San Fernando in the near future. A. DE C.

EASTERN CANADA.

(Special Correspondence.)

OTTAWA, ONT., MARCH 12.—The city of Winnipeg will oppose the Conmee bill now before Dominion parliament, for a blanket charter of all waterways between the Great Lakes and Winnipeg. If such a charter be granted, it is claimed it might interfere with the big hydroelectric plant that the city has under construcion.

It is said to be now a matter of months before an electric iron smelting plant will be established at the Chats Falls on the Otawa River, near Arnprior, Ont. This is expected to revolutionize the iron ore in the Ottawa Valley, but smelting has hitherto been impossible owing to the great cost of obtaining a coal supply. This obstacle will be entirely overcome by the use of electricity. The exhaustive experiments in iron ore smelting by the electric process, made by the Dominion government, have proved satisfactory.

A monorail electric railway may soon be constructed between Ottawa and the town of Morrisburg, Ont. This is an invention of a citizen of Sherbrooke, Que., and if it is found practical by the Morrisburg & Ottawa Railway Company, it will be built instead of the ordinary ground line. The proposed monorail line differs from that operated on the gyroscope principle. It has its main rail about twenty feet above ground, supported by iron posts close together. The cars are in three compartments, one above this main rail, and one compartment hanging down an each side of it, with two lighter rails nearer the ground, against which wheels from the lower compartments will run, and make the tipping over of the car impossible. The top compartment is designed for the use of passengers, and the lower ones will be used for freight. The motive power wheels run on the top rail. The system does away with all

grading, etc., and is much more cheaply constructed than the ground lines. This new system is said to have given perfect results on the trial line built by the inventor.

The Bergmann Electrical Works, of Berlin, Germany, said to be one of the largest concerns in the electrical business in that country, is coming over to Canada, and is looking for a site in Ottawa. The company manufactures, among other things, the Tungsten electric lamp. It is the intention of the German company to erect, as a beginning, a Tungsten lamp factory for Canada in this city. The company desires in Ottawa a plant of 40,000 square feet ,having its own water power of about 500 horsepower, and a gas supply of 10,000 cubic feet per day. The Bergman concern has a capitalization of $8,000,000, and employs 6,000 workmen. It is the company's intention not only to erect electrical works in Canada, but also to extend its business operations in this country for the purpose of importing its different electrical goods and mechanical apparatus, which can now be done at a very low rate, owing to the abolition of the German surtax by the Dominion government. The company is said to have a very high financial standing both in the United States and in Europe. W.

IMPORTANT DEVELOPMENTS.

TO DAM THE BAKER RIVER.—The Guggenheims, associated with J. C. Edon, president of the Superior Portland Cement Company, are to begin work at Bellingham, Wash., on a concrete dam, 160 feet high, to be placed across a deep gorge on the Baker River, a mile above the Washington Cement Company's plant. A reinforced concrete flume will be built to the powerhouse, 4,500 feet away, to develop 25,000 horsepower. A.

POWER FOR ALL ALABAMA.—The Alabama Power Company, made up to a great extent of Alabama capital, has camped its corps of men on the bank of the Coosa River, fifty miles from Montgomery, to construct the big dam, No. 12, that will furnish the State with 50,000 horsepower in hydroelectric drive. The undertaking promises great things for Alabama's future manufacturing interests. The utilizing of the great power of this river supplied from a water shed of thousands of square miles in three states, has been an Alabama potentially in charge of Capt. H. B. Ferguson, which has been wasted. The work is under way now and the first 50,000 horsepower dam is only the beginning for there are to be five more of the dams, supplying enough water power to furnish all of Alabama with electric driving power.

TO BUILD PLANT AT REDONDO, CAL.—Particulars concerning the incorporation of the Pacific Light and Power Corporation have been given out by N. W. Halsey & Company, of San Francisco, Cal. The company has been incorporated with a capitalization of $40,000,000 to take over the properties of the Pacific Light and Power Company, subject to outstanding bonds. The stock consists of $5,000,000 in first preferred stock, $10,000,000 in second preferred stock and $25,000,000 in common stock. The proceeds of the first million and a half dollars of the preferred stock sold will be used for the construction of a 10,000-kilowatt plant at Redondo, Cal., and for constructing distributing lines and other betterments, as well as for the taking up of the outstanding indebtedness of the Pacific Light and Power Company. Later, bonds to the amount of $40,000,000 will be issued to cover the bonded indebtedness of the old company and to make extensions.

LIGHTING AND POWER.

(Special Correspondence.)

PHOENIX, ARIZ.—This city has voted bonds for a municipal light and power plant. A.

DUNSEITH, N. D.—John Gottbreht is considering putting in electric lights here, at Perth and at Bisbee. C.

RUGBY, N. D.—Mr. Tompkins will shortly commence work on remodeling and enlarging the electric light plant. C.

WHEATLAND, WYO.—A vote will be taken April 22 on issuing bonds for $15,000 for the installation of an electric light plant. C.

HUNTINGTON PARK, CAL.—The Los Angeles Gas and Electric Company will soon supply this place with electricity for light and fuel. A.

FRESNO, CAL.—The dam being constructed at Crane Valley by the San Joaquin Light and Power Company will be finished about August 1.

MINNEAPOLIS, MINN.—The contract for the installation of twenty-five new fire alarm boxes was let to the Gamewell Fire Alarm Company for $3,125. C.

MORGAN, MINN.—The village council let a ten-year contract to the Wherland Electric Company, of Redwood Falls, Minn., for the supply of electric lights. C.

FRESNO, CAL.—John S. Eastwood has assigned to the Mammoth Power Company, a water right appropriation of 50,000 inches in the San Joaquin River. A.

CENTRALIA, WASH.—The J. A. Venness Lumber Company has been granted a twenty-five year franchise for an electric light line along certain county roads. A.

CHIPPEWA FALLS, WIS.—The Chippewa & Flambeau Development Company has been organized to build dams on the Chippewa and Flambeau rivers. C.

WAVELAND, IND.—The town board has under consideration the installation of a new lighting plant. The present obsolete system is not giving satisfaction.

GLENS FALLS, N. Y.—The Mills Power Company has been incorporated with a capital of $50,000 by J. H. Cross, J. W. Russell, of Glens Falls, and T. D. Cross, of Sandy Hill.

CORNING, CAL.—The Sacramento Valley Power Company has been granted a franchise for a power line along the streets of this city. Work on the line is to begin at once. A.

ELGIN, TEXAS.—The Elgin Light and Power Company, which was recently organized with a capital stock of $15,000, will soon have its new plant finished and ready for operation. D.

EAST CHICAGO, IND.—Official announcement has been made by the Hubbard Steel Company that it would soon ask for bids for the erection and equipment of a new power plant. S.

RED BLUFF, CAL.—Leon Bly has purchased from C. E. Burress, a section of Township twenty-seven, in the interests of the Butte and Tehama Power Company, for power purposes. A.

LOS ANGELES, CAL.—An ordinance has been passed for the installation of the necessary appliances for the lighting with electricity of Pico street from Main to Vermont street. A.

EL PASO, TEXAS.—A complete electric power plant has been installed here by F. M. Hunt of the Hunt, Mirk and Company of San Francisco, for the Northwestern Portland Cement Company. A.

LOS ANGELES, CAL.—The Edison Electric Company will build and complete within a year, a $2,000,000 power plant at Long Beach. It will be a steam generating plant, with 30,000 horsepower capacity. A.

MARFA, TEXAS.—The Marfa Power Company, whose electric light and ice plant and telephone exchange were recently sold to satisfy the claims of creditors, will be reorganized and important improvements installed. D.

ANOKA, MINN.—A vote will be taken on bonding the city for the construction of a power dam on the Rum River, seven miles above Anoka. The dam will be twenty feet high, of concrete construction and the cost is estimated at $100,000. C.

AMECA, STATE OF JALISCO, MEXICO.—The Magistral-Ameca Copper Company will install an electric light plant at its mines in this district. Its mines and reduction mill will be illuminated from that source. James P. Harvey is general manager. D.

TACOMA, WASH.—Wright, Sweeny and Cummings, for their bid of $655,225, have been awarded the contract to construct the first unit of the city's Nisqually power plant at LeGrande on the Nisqually River, thirty miles from Tacoma. A.

SPOKANE, WASH.—H. L. Moody of this city, and J. L. Leeper of Orient, have applied for a power site on the Kettle River. The site will be developed to furnish electricity and water will be taken from that point in the river for irrigation purposes.

JEFFERSONVILLE, IND.—The United Gas and Electric Company, operating in this city and New Albany, has appropriated $50,000 for improvements to be installed this year. The capacity of the plants will be extended and other modern equipment added. S.

PINE RIVER, MINN.—This city is to be lighted by electricity as soon as the machinery ordered by H. A. and T. L. Arvig has been installed. The equipment consists of two twenty-five horsepower gasoline engines, and a generator of suitable capacity.

SEATTLE, WASH.—The Seattle Lighting Company has commenced the erection of a barn, material sheds, a warehouse and office building, all one-story, of paving brick with tile roofs, 120 by 120, to cost $20,000. Spalding & Umbrecht are the architects. C.

AUBURN, CAL.—Mr. Muir is bringing water from just below Forest Hill to Green Point, at the junction of the North and Middle Forks of the American River, about three miles east of Auburn, where he will erect a power plant to generate from 25,000 to 30,000 horsepower. A.

INDIANAPOLIS, IND.—The Board of Public Safety has decided to ask for bids for the lighting of all public buildings. The alleged inequalities in rates running from four and one-half to twelve and one-half cents per kilowatt-hour has occasioned the board to make the matter a competitive one. S.

FALLON, NEV.—J. B. Daniel has secured from the government, a lease on the power site on the Truckee-Carson Irrigation canal, sixteen miles west of Fallon. Mr. Daniel will build a plant costing about $50,000. It will generate 2,000 horsepower and supply Wonder and Fairview with light and power. A.

INDIANAPOLIS, IND.—The Board of Public Safety has let contracts for lighting the fire and police department buildings so as to effect a saving of $200 a month. The board received competitive bids and the rates obtained ranged from two and one-half cents to seven and one-half cents per kilowatt-hour. S.

BIDDEFORD ME.—It is reported that the Pepperell Manufacturing Company contemplates the erection of a large power plant on Factory island in Saco. If the plans contemplated are executed a plant capable of furnishing power for both the Pepperell and Laconia divisions of the Pepperell company will be built.

SACRAMENTO, CAL.—William Muir of San Francisco is planning to bring water from below Forest Hill to Green Point, at the

junction of the north and middle forks of the American River, three miles east of Auburn. At Green Point Mr. Muir plans to erect a large power plant, which will generate from 25,000 to 30,000 horsepower.

EVANSVILLE, IND.—Announcement has been made by Charles H. Gillham, secretary of the Public Service Company, that work on the underground system of pipes and conduits will begin in a few weeks. By the middle of April the company officials hope to have 200 laborers digging the trenches for the pipe and placing the poles for the lighting wires.

RED BLUFF, CAL.—Dr. West, director of the Tehama County Power & Transit Company, has filed a notice, appropriating 300,000 inches of the water of the Sacramento River at the mouth of the Red Bank Creek, three miles below Red Bluff. The water is to be used for the development of electric power for distribution in Tehama, Glenn, Colusa and Yola Counties.

GREEN BAY, WIS.—Among the concerns that have already contracted to use power from High Falls, where the Northern Hydro Electric Company is building the water power on the Peshtigo river, are the Henry Rahr's Sons Company, the John Hoberg Company, Green Bay Paper & Fibre Company and the Northern Paper Mills. The three paper mills are among the largest in this vicinity.

RED BLUFF, CAL.—The Northern California Power Company has made a rate reduction to the users of its lights and power. For sixteen candlepower incandescent lights in residences, $1.00 per month for four lights, and twenty cents for each additional light. For business houses the rate is $1.00 per month for two sixteen candlepower incandescent lights and forty cents for each additional light. A.

HARTFORD CITY, IND.—The deciding vote cast by Mayor Sweigart resulted in extending the franchise of the Hartford City Light Company for a term of twenty-five years, and the street lighting for ten years. In return for the franchise extension and street lighting contract the city will be given a lower rate for power and lights, install additional lights, build a new dynamo plant, install new electric machinery in all estimated to call for an expenditure of $25,000.

RAYMOND, WASH.—The South Bend-Raymond Electric Company is adding a new 600-kilowatt turbine set to the dynamos already in use at Raymond to supply the increased demand for light caused by the growth of the city. Wires have been extended to the Riverdale Addition on the north side of the Willapa River. The section of the city across the South Fork will also have electricity as soon as the wires can be strung on the poles which are already set. A twenty-four hour service has been established.

NOBLESVILLE, IND.—The Noblesville Heat, Light and Power Company has turned on the current generated in its hydraulic plant on White River. The current is furnished by five large turbine wheels which are kept in constant motion by the water from the forebay at the end of the dam. Every branch of the plant works perfectly. The prospect for cheap power and light in Noblesville is good and manufacturers are coming here to investigate the possibilities of the plant. S.

PAUFER GROVE, CAL.—Work has been started on the transmission line which is being built from this city to Spreckles to supply power to the factories there. A line is also being built between Monterey and Salinas. When work on these lines is completed Salinas, Spreckels and other places along the line will be supplied with electricity for lighting and power purposes from the big plant at Monterey. The Salinas plant will not be abandoned, but will be held in reserve, to be used when necessary.

ASHLAND, KAN.—The city council let the contract for the installation of an electric light and power system to the Squires Electric Construction Company of Kansas City. Three miles of mains are to be laid, a 50,000 gallon tank and tower erected and a 1,900 light generator installed. The contract includes the construction of a suitable brick power house with everything installed ready for operation, except the engines. The contract price exclusive of power is $25,250 and the work must be completed in four months.

PACHUCA, MEX.—Confirmation is had of the recent report that the Hidalgo Hydroelectric and Irrigation Company's power plant and transmission line holdings, that were recently acquired by the Mexican Light and Power Company, will be merged into the latter's system. There is great activity in mining operations in the Pachuca district at this time and the demand for electric power is constantly increasing. More than 6,000-horsepower is now being used, and it is stated that double this amount will find a ready sale as soon as the company can arrange to provide it. D.

YORK, ME.—A contract has been signed by which the York Light and Heat Company agrees to furnish electric power to the Atlantic Shore line railroad. This power has been furnished for some months in part, by the Biddeford and Saco Railway Company. Recently the York Light and Heat Company acquired the plant of the Kennebunkport Electric Light Company, which community they will also light from the plant in this city. These two new contracts will call for so much additional power that an increase will be made to the company's plant. This will be provided by a large engine which will be installed in their Water street station in time to be placed in commission during the early part of the summer.

ELECTRIC RAILWAYS.

(Special Correspondence.)

FRESNO, CAL.—The Fresno Traction Company has been granted an electric street railway franchise. A.

BAKERSFIELD, CAL.—The Power Transit and Light Company has presented an application for a fifty year electric railway franchise. A.

MAGNOLIA, IOWA.—A meeting of citizens has been held to promote the construction of the electric line from Sioux City to Omaha. C.

MINNEAPOLIS, MINN.—The Twin City & Lake Superior Railway Company expects to have its short line completed in eighteen months. C.

SACRAMENTO, CAL.—An electric railway franchise from Y to Tenth streets has been granted the Sacramento Electric, Gas a Railway Company. A.

CLARINDA, IOWA.—The Iowa & Southwestern Railway Company has been incorporated with a capital of $300,000 to construct a railroad to Blanchard. C.

CENTERVILLE, IOWA.—The Centerville Light and Traction Company has purchased a site, 500 by 100, for car barns and repair shops and freight yards. C.

ALAMEDA, CAL.—The Southern Pacific Railroad is about to extend its electric service to Elmhurst and Melrose over the old right of way, through Bay Farm Island A.

BELLINGHAM, WASH.—Stock in the Whatcom County Railway & Light Company for $400,000, has been subscribed preliminary to the construction of an interurban line to run to Skagit county points. C.

HUTCHINSON, KAN.—Work has been started on the Monroe Street extension of the street railway. The line construction work is under way and the track will be laid as soon as the ground has thawed.

FREMONT, NEB.—Mayor Burrell has signed the ordinance granting the Nebraska Transportation Company an interurban franchise. It is understood that the company will accept the terms of the ordinance.

SEATTLE, WASH.—The last rails of the Seattle-Everett interurban line have been laid and within a few weeks the line will be in operation. New cars for the interurban service have not yet been received.

SACRAMENTO, CAL.—The Central Traction Company has resumed work on its road between this city and Stockton, the temporary injunction, which stopped work on the Upper Stockton road, having been dissolved. A.

McLEANSBORO, ILL.—At a meeting of the directors of the Illinois Oil and Coal Belt Railway Company, the following officers were elected: General J. R. Campbell, president; Joseph W. Crowley of Robinson, vice-president. Construction work will begin about June 1.

CEDAR RAPIDS, IOWA.—The Cedar Rapids & Marion City Railway Company will expend $45,000 in improvements at its power house, comprising a one-story brick addition, seventy by fifteen, a 1,500-horsepower engine, 500-horsepower boiler, modern stokers, condensers, air and circulating pumps, etc. C.

SAN FRANCISCO, CAL.—The Vallejo and Northern Railroad Company has been granted a fifty-year electric railway franchise, covering the same privileges granted the company two years ago. The franchise provides that work is to be commenced within six months and the road completed in three years. A

PEORIA, ILL.—The Peoria Southern Railway Company and the Peoria Northern Railway Company have filed articles of incorporation. Both of these companies are to become a part of the Illinois traction system. The incorporators are H. E. Chubbuck, W. H. Carnahan, H. J. Vance, H. C. Dillon and W. J. Achelpohl.

LOS ANGELES, CAL.—The Ontario and San Antonio Heights railroad has just been completed, forming a new link in the Huntington system of interurban trolleys, extending from Los Angeles, through Southern California. The Pacific Light and Power Company, controllers of the company, have placed on the market $300,000 worth of bonds. A.

SAN FRANCISCO.—Horace G. Platt, president of the Geary street, Park and Ocean Railroad, received an order from the Superior Court restraining the city and county of San Francisco from proceeding with the sale of the Geary street railway bonds. The supervisors had directed the preparation of a resolution to call for bids on the half million dollars worth of Geary Street Railway bonds. A.

FITZGERALD, GA.—Grading has been started on the Fitzgerald and Ocilla Electric Railway, and it is said will be pushed to early completion. The enterprise includes a complete street railway system for this city, a suburban line to the A., B. and A. shops besides the line to Ocilla. Two ship loads of rails have arrived at Savannah, while large quantities of ties have been contracted for locally.

SAN FRANCISCO, CAL.—An ordinance is now before the Board of Supervisors ordering the United Railroads to run the Sutter

street cars to the ferry on the inside Market street tracks, owing to an alleged forfeiture of the Market street portion of the Sutter street franchise. The ordinance gives the United Railroads authority to install the necessary switch, requiring that the switch be completed by April 15. A penalty from $50 to $100 per day may be imposed for failure to comply with this order. A.

OWOSSO, MICH.—The franchises of the Commonwealth Power Company, of Jackson, and the Lansing & Northeastern railway, of Lansing, were accepted at a recent special election. The Commonwealth company has closed negotiations for the purchase of the Owosso-Corunna Electric Company, operators of the electric line between this city and Corunna. The Lansing & Northeastern Company has its line between this city and Lansing finished as far as Morrice, and expect to complete the work between this city and Owosso at once.

ROME, GA.—The Rome Railway and Light Company has announced that it will begin work on an extension of its tracks in north Rome. The tracks will be extended from the present terminus at the north Rome depot of the Southern, to the Southern Co-operative foundry. As soon as the extension is completed a 15-minute schedule will take the place of the present 20-minute schedule. Another improvement for which the trolley company has sought a permit from the City Council is the erection of a one-story concrete transfer station, in the middle of Broad street, midway between Second and Third avenues.

BOSTON, MASS.—All the bridge work is done, the blasting completed, the roadbed sub-graded and some of the rails are laid on the new electric street railway line through Middlesex Fells. Cars should have been running through by this time, connecting Sullivan square with Stoneham square, but the Boston & Northern Street Railway Company found the road work a little harder than is usually encountered, owing to the exceptional severity of the winter, and could not finish the job by the time originally set. An extension of time to April 15 has been granted and there is little occasion for doubt that the service will open about that date.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

PIERRE, S. D.—The question of granting a second telephone franchise is being discussed. C.

GOODRICH, N. D.—The Goodrich Telephone Company will extend its lines to Starck and Phoenix. C.

GREGORY, S. D.—The Inter-State Telephone Company will build a full copper line over the whole system. C.

LIVINGSTON, MONT.—The Montana Independent Telephone Company will install an automatic telephone system. C.

GREENBUSH, MINN.—The McMahan Telephone Company will put in a new switchboard and rebuild the exchange. C.

HEMINGFORD, NEB.—The local telephone company will erect a fireproof exchange building, estimated to cost $900. C.

DE SMET, S. D.—The Spirit Lake Telephone Company, capital $10,000, has been incorporated by J. L. Van Hook, O. N. Anlers and others. C.

PINE RIVER, MINN.—The telephone company will build a line which will follow the line to Emily to Jenkins and thence to the town line of Grant. C.

GALGARY, ALTA.—The provincial government applied for a permit for the erection of an extension to the telephone exchange on Seventh Avenue to cost $8,000. C.

BROOKLYN, N. Y.—A new local and long distance telephone system is soon to be installed in the Brooklyn navy yard. The system now in use was installed about twenty years ago.

JACKSON, MISS.—The building of the Home Telephone Company is nearly completed and the new telephone system will be in operation in a short time.

WICHITA, KAN.—The home office of the Anderson Electric Company is to be moved from McPherson to this city. The company manufactures lockout telephone apparatus.

FAIRMONT, MINN.—The Fairmont Telephone Company has purchased the supplies to be used in rebuilding the north section of the system. The improvement will cost $2,000, and work will be commenced in the spring. C.

NEW ORLEANS, LA.—The Cumberland Telephone and Telegraph Company has purchased a site for the erection of a modern telephone exchange which will be completed in about six months. This, which is the seventh office of the company, will begin business with about 1,000 telephones.

AUSTIN, TEX.—The Austin City Telephone Company, which has been operating here for the past several years as an independent company, was absorbed on March 1 by the United Telephone Company of Austin. The capital stock is $300,000, and it is owned by Northern capitalists. The incorporators are I. B. Cameron and H. M. Daugherty, Columbus, O.; James S. Brailey, Toledo, O., and W. D. Hart and G. W. Allen, Austin. Mr. Hart said that the installation of an automatic switchboard is among the improvements to be made. The company for present will operate in Travis, William and Bell Counties.

ELECTRICAL SECURITIES.

A very large aggregate of new bond issues offered for public subscription by syndicates last week made large requirements on the supply of banking credits and tightened the interest rates for money. The fixing of the interest rate on the projected New York city bond issue at four and one-quarter per cent, compared with preceding issues at four per cent, was significant of the necessities confronting those concerns which seek to enlist new capital in enterprise, which include the railroads of the country quite generally and many large corporations as well. Demand for steel products was reported improving. The February copper statistics were distinctly disappointing, deliveries into consumption, especially for export, falling off largely from January, while the rate of production rose.

The elevated railroads in Chicago carried 77,261,100 passengers in the last six months of 1909—a daily average of 420,000—according to a report sent to the City Comptroller by the Union Loop Company, accompanied by a check for $39,511, the city's share of profits.

The Wisconsin Railroad Commission has authorized the issue of another $1,000,000 of four and one-half per cent bonds by the Milwaukee Electric Railway and Light Company. The new financing will make a total of $7,728,000 of these bonds outstanding, and is to be consumated to provide for extensions.

At the annual meeting of the United Wireless Telegraph Company, L. C. Wallace was elected a director to succeed I. Newton Snively, deceased. F. X. Butler and E. P. Davis were added to the board. Other directors were re-elected. Directors of the United Wireless Telegraph Company have re-elected the officers.

Chicago City Railway Company, quarterly dividend of two and a half per cent, payable March 30 to stock of record March 4. The Chicago City Railway two and one-half per cent dividend is the first for this fiscal year and hereafter quarterly declarations will be at the same rate, or ten per cent annually without extra disbursements as heretofore. Last year, four quarterly declarations at one and one-half per cent each were declared and four per cent extra, making ten per cent against nine per cent for the previous year, including three per cent extra.

The February gain in Brooklyn R. T. earnings averaged about $3,000 per day, or nearly $90,000 for the month, which is somewhat less than the $120,000 increase in January and but half of the daily average gain for the first half of the year to December 31 of $6,000. At the same time, for eight months gross receipts have increased $1,125,000, or practically as much as the gain for the four previous fiscal years ended June 30 last.

The Pacific Telephone and Telegraph Company has sold to Band & Goodwin, of New York, $3,000,000 five per cent bonds and $7,000,000 four and one-half per cent two-year notes. The bonds are a portion of the $35,000,000 issue dated January 2, 1907, of which $20,000,000 were already outstanding; of the remainder $12,000,000 were made issuable for only sixty-six and two-thirds per cent of the cost of improvements. The notes are payable at maturity in cash or bonds at a figure agreed upon, at option of company.

DIVIDENDS

American Telephone and Telegraph Company, quarterly dividend of two per cent, payable April 15.

Duluth Edison Company; quarterly dividend of one and one-half per cent, payable April 1.

Manila Electric Railroad and Lighting Corporation; one per cent on common stock, payable April 1.

Minneapolis General Electric Company; quarterly dividend of $1.50 payable March 31.

Philadelphia Traction; semi-annual dividend of $2, payable April 1.

Seattle Electric Company; semi-annual dividend of three per cent, payable April 1.

Standard Underground Cable Companys' stock dividend of twenty-five per cent. The stockholders have voted to increase the capital stock from $2,800,000 to $3,500,000. The stock is quoted around $320. In January an addition to the regular dividend, three per cent extra and a fourteen per cent special dividend were declared.

NEW YORK.

	Mar. 14.	Mar. 7.
Allis-Chalmers common	12	11⅞
Allis-Chalmers preferred	42	42
Amalgamated Copper	78¾	81¾
American Tel. & Cable	*80	*80
American Tel. & Tel.	141¾	141⅜
Brooklyn Rapid Transit	76½	75½
General Electric	154	154½
Interborough-Metropolitan common	22⅛	21¾
Interborough-Metropolitan preferred	56⅜	55
Kings County Electric	129	129
Mackay Companies (Postal Telegraph and Cables) common	89¼	90
Mackay Companies (Postal Telegraph and Cables) preferred	76⅞	76½
Manhattan Elevated	138½	137
Metropolitan Street Railway	15	15
New York & New Jersey Telephone	123½	123½
U. S. Steel common	88¼	85⅝
U. S. Steel preferred	122	121
Western Union	75½	77
Westinghouse common	73	73
Westinghouse preferred	130	130

*Last price quoted.

BOSTON.

	Mar. 14.	Mar. 7.
American Tel. & Tel.	141¼	141⅜
Edison Elec. Illuminating	249	247

General Electric	154	154½
Massachusetts Electric common	18	18¼
Massachusetts Electric preferred	84	83
New England Telephone	138	136
Western Tel. & Tel. common	16	15
Western Tel. & Tel. preferred	88	88½

PHILADELPHIA.	Mar. 14.	Mar. 7.
American Railways	45½	45⅝
Electric Company of America	12	12
Electric Storage Battery common	64	59½
Electric Storage Battery preferred	64	59½
Philadelphia Electric	15⅛	15¼
Philadelphia Rapid Transit	21	22⅜
Philadelphia Traction	85¾	88
Union Traction	48¾	49⅛

CHICAGO.	Mar. 14.	Mar. 7.
Chicago Railways, Series 1	104	106½
Chicago Railways, Series 2	32	32½
Chicago Subway	3	3¼
Chicago Telephone	132	131½
Commonwealth Edison	116	115
Metropolitan Elevated common	16	16
Metropolitan Elevated preferred	53	54
National Carbon common	110	108
National Carbon preferred	119	118

PERSONAL MENTION.

F. M. McENIRY, of Racine, Wis., has succeeded J. T. Quinlan as manager of the Green Bay district of the Wisconsin Telephone Company.

FREDERICK G. WEESE, division superintndent of the Inter-State Telephone Company, died at his home in Bordentown, N. J., on March 4, at the age of seventy-one.

FREDERICK GERHARD, with William P. Bonbright & Company, has been appointed assistant secretary and assistant treasurer of the Central Mexico Light and Power Company.

F. W. WITHERAL, of Eau Claire, Wis., has taken the position of engineer with the Ambursen Hydraulic Construction Company in the work of constructing the dam at Rapidan, Minn.

EDWARD HEMMENT, JR., of Philadelphia, has gone to Sheboygan, Wis., to become superintendent of the Sheboygan Light, Heat and Power Company. He succeeds Henry J. Pagel, who has been promoted to head of the rolling stock department.

H. THURSTON OWENS, consultinging engineer, New York city, recently delivered a lecture on street lighting, under the auspices of the Board of Education. This lecture is to be repeated on the evening of March 30, at Public School No. 186, 145th street, west of Eighth Avenue, New York city.

E. J. KULAS, president of the Tungstolier Company, and of the Central Station Development Company, of Cleveland, Ohio, sailed for Europe on March 12 on the steamship President Lincoln. Mr. Kulas is taking a long-needed rest, and it is expected he will return about the middle of April.

EDWARD LYMAN WILDER, has resigned his position with the Westinghouse Company, and has accepted a position in the engineering department of the Rochester Railway and Light Company. Mr. Wilder will study the storage battery as applied to vehicle service, making comparative tests of well known types of batteries.

DR. WILLIAM MERRICK GRAY, pathologist at the army medical museum in Washington, and an authority on X-ray treatment, dropped dead last week in his laboratory while engaged in X-ray experimentation. Examination by physicians and the Coroner revealed that he had succumbed to heart disease. Dr. Gray was fifty-seven years old.

E. P. WOOD, formerly engaged in power work in Deadwood, S. D., has been made general manager of the Colorado Railway Light and Power Company of Trinidad, Colo. G. W. Harlan, who some years ago was with the old Trinidad Electric Railway Light and Power Company, has become auditor of the same company. Both of these changes took effect on March 1.

DR. EDWARD G. ACHESON, president of the International Acheson Graphite Company, Niagara Falls, N. Y., has been awarded the Perkin Medal, by the unanimous vote of the Society of Chemical Society, and the American Electrochemical Society. The Perkin medal is awarded annually to the American chemist, who has done the most valuable work in applied electricity.

JOHN CORSCOT has retired from his position of general manager of the Madison Gas and Electric Company, after a service of fourteen years. His successor is to be announced at the directors' meeting this week. The man has been chosen by the McMillin syndicate, which controls the company, but his name not yet announced. He is from Detroit. Mr. Corscot will remain with the Madison Gas and Electric Company as vice-president, with much lessened work.

BENJAMIN BAKER and HERBERT M. WILCOX have been added to the staff of Walter B. Snow, publicity engineer, 170 Summer Street, Boston, Mass. Mr. Baker was formerly associated with the *Boston Transcript* and was also former editor of *The Navy*. Mr. Wilcox is a chemical engineer, experienced in various industries. Mr. Snow announces that his office facilities have been more than doubled by removal to rooms 421, 422, 423 and 425 in the building at the above address.

C. A. GREENIDGE, has recently taken a position as an engineer in the operating department of J. G. White & Company, of New York, N. Y. Mr. Greenridge has had much experience in the operation of electric light and power plants, and has also carried on some special investigations as to power economics. For several years he was connected with the Utica Gas and Electric Company, first as resident engineer, later as superintendent of the electrical department, and finally as general manager.

WILLIAM A. TURBANE, late electrical engineer with the Gould Storage Battery Company and Gould Coupler Company, of Depew, N. Y., has accepted the position with The United States Light and Heating Company of Maine as Special Engineer, in connection with storage battery and car lighting work. Mr. Turbayne has been long identified with the progress of regulating apparatus, and will devote a large part of his time to the development of a number of systems for The United States Light and Heating Company. His address will be the Storage Battery Works, 368 Massachusetts Avenue, Buffalo, N. Y.

C. C. BRADFORD, who has been identified with the New York office of The United States Light and Heating Company as Manager of the sales department, has been transferred to the Cleveland office, vice Mr. A. B. Weil resigned. Mr. Bradford leaves a host of friends in the East, but goes to a territory with which he has been long familiar, owing to the fact that Cleveland is his home city. Mr. Bradford will cover the states of Ohio, West Virginia, Kentucky, part of Indiana, Michigan and Pennsylvania. His headquarters will be made, however, at the office of The United States Light and Heating Company at Cleveland, 2064 Euclid Avenue.

PROPOSALS.

POST OFFICE, HATTIESBURG, PA.—The office of the Supervising Architect, Washington, D. C., will receive sealed bids until April 4, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the United States Post Office at Hattiesburg, Miss., in accordance with drawings and specification, copies of which may be had from the custodian of site, at Hattiesburg, Miss., or at the Supervising Architect's offive.

POSTOFFICE, ENID, OKLA.—The office of the supervising architect, Washington, D. C., will receive sealed bids until April 27, for the construction complete (including plumbing, gas piping, heating apparatus electric conduits and wiring), of the United States postoffice and courthouse at Enid, Okla., in accordance with the drawings and specification, copies of which may be obtained from the custodian of site at Enid Okla., or at the Supervising Architect's office.

POST OFFICE, BRAINERD, MINN.—The office of the Supervising Architect, Washington, D. C., will receive sealed proposals until March 31, for the construction complete (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the United States Post Office at Brainerd, Minn., in accordance with drawings and specifications, copies of which may be obtained from the custodian of site, Brainerd, Minn., or at this office, at the discretion of the Supervising Architect.

NEW INCORPORATIONS.

ST. PAUL, MINN.—The Norris Electric Company has been incorporated with a capital of $50,000 by H. L. Norris, E. K. Norris and J. C. Hutchinson.

BROOKLYN, N. Y.—The American Electricity Economizing Company has been incorporated with a capital of $100,000. Charles I. Friedman is one of the directors.

NEW YORK, N. Y.—The Telantophote Company has been incorporated with a capital of $50,000 to construct telephone lines etc. The incorporators are Sidney Rothschild, Benj. Rosenberg and Joseph A. L. Gardiner.

JERSEY CITY, N. J.—The General Transmission Company has been incorporated to transmit intelligence or sound in any method or manner by wire or by wireless communication. The capital is $100,000 and the incorporators are: H. Lieber, W. W. Goach, H. Page, Dr. H. Schweitzer and J. R. Turner, Jersey City.

NEWARK, N. J.—The Meisselbach, Catucci Manufacturing Company has been incorporated with a capital of $200,000 to do an electrical and mechanical engineering business. The incorporators are August F. Meisselbach, Pliny Catucci, Norman E. Zusi, Edward Zusi, E. Theophelus Roos and Henry C. Koegel, all of Newark.

TRENTON, N. J.—The International Telephone Supply Company was incorporated at Trenton, N. J., with capital of $1,000,000 fully paid in. The object is to manufacture and deal in telephone and telegraph supplies. The incorporators are John C. Burmeister of Chicago and William H. Agricola and Robert P. Manly of New York.

ELKHART, IND.—The Brice H. Reed Company has incorporated with a capital stock of $25,000. The object of the company is as follows: To manufacture electrical specialties and electrical goods and commodities of all kinds, and to retail and wholesale the products of the plant. Brice H. Reid, A. B. Reid and Clyde E. Ingerson, directors. S.

INDUSTRIAL ITEMS.

THE DUPLEX METALS COMPANY, 149 Broadway, N. Y., has issued a folder showing a section of a copper clad billet and a magnified view of the line of the weld.

THE ECK DYNAMO AND MOTOR COMPANY, Belleville, N. J., is issuing a folder descriptive of its oscillating and Universal adjustable desk type fans. Several illustrations of "Hurricane" fan motors are shown.

THE TRUMBULL ELECTRIC MANUFACTURING COMPANY, Plainville, Conn., has issued its March number of Trumbull Cheer. The booklet contains the usual good stories and business philosophy and some excellent points on Trumbull specialties.

THE McCULLOCH-MOSS LUMBER COMPANY, Minneapolis, Minn., has been shipping twenty to thirty-five foot cedar poles for use on a toll line in Louisiana. When it is considered that the freight on each pole from Minnesota to Louisiana exceeds the cost per pole the desirability of cedar poles is appreciated.

THE VALENTINE-CLARK COMPANY, 234 La Salle street, Chicago, Ill., is distributing a circular calling attention to the process used by the company in preserving its well-known western cedar poles and also to the excellent shipping facilities at its main yards which permits of immediate delivery of all orders received. Ten trunk lines are available for this purpose.

THE ALLIS-CHALMERS COMPANY, Milwaukee, Wis., has received an order from the Pittsburg Coal Company for electrical equipment to be used in its various mines. For furnishing the increased power three 150-kilowatt 525/575-volt, direct-current generators have been purchased. One will be used for the mine at Bruceton, another at Cliff Mines, and the third at Sturgeon, all in Pennsylvania.

THE AMERICAN SHIP WINDLASS COMPANY has recently sold to the Detroit Edison Company, four thirteen-retort Taylor stokers to be used with two 2,300 horse-power Stirling boilers. This great output from a single boiler is secured by double firing with a stoker at each end, each boiler having a furnace twenty-six feet by fifteen feet. The Taylor stoker was selected because of its great overload capacity.

THE REYNOLDS ELECTRIC FLASHER MANUFACTURING COMPANY, Chicago, Ill., is distributing a booklet on the Reco Whirler and the Reco Revolving Sextant. The sextant is a revolving platform which is turned by a motor, through sixty degrees at a time, pausing between each partial revolution. It is used especially for window displays and revolving signs. An illustration of the Reco reducing gear is also shown.

THE DI-EL-ITE MANUFACTURING COMPANY, 120 Liberty Street, New York, N. Y., is distributing an attractive portable sign-card about nine by seven inches in size, devoted to the Dim-A-Lite socket. These sockets which fit any incandescent lamp up to sixty watts in capacity are equipped to reduce the current supply a lamp three distinct stages. The only operation necessary is a slight pull on the cord which inserts the resistance necessary.

THE DUPLEX METALS COMPANY, Singer Building, 149 Broadway, N. Y., has just published a bulletin regarding the office and mill of the company. The office, in the thirty-second floor of the Singer building, commands an excellent view of New York in every direction. Some excellent illustrations taken from the office windows are shown. The facilities of the mill are also described, and several engravings illustrate the various operations of making their Copper-Clad steel wire.

THE CUTLER-HAMMER MANUFACTURING COMPANY, which manufactures motor controlling devices, is moving its Schureman plant from Chicago, to the main factory at Milwaukee. S. M. McFedries, who has been in charge of the Schureman plant, will hereafter have his headquarters in Milwaukee. A large portion of the Schureman force will also be taken along and the well known Schureman designs of motor controlling devices will be continued. The moving of the Schureman plant of course will enable the Cutler-Hammer company to serve its customers even better than heretofore.

HUBBARD AND COMPANY, Pittsburg, Pa., announce that the Peirce department, formerly the Peirce Specialty Company of Elkhart, Ind., has been moved to its new building erected at the main works of Hubbard and Company, Pittsburgh, Pa. C. L. Peirce, Jr., manager of the department states that the volume of business since last October in the Peirce line has broken all previous records, and severely taxed the capacity of the Elkhart plant. This is doubled at the new plant, with provisions for further increasing it. The general galvanizing plant has also been doubled in order to provide for the output of the Peirce department.

THE ELECTRO-DYNAMIC COMPANY, Bayonne, N. J., is distributing a publication, designed as Circular No. 38, which contains a complete set of tables respecting the ratings and dimensions of the inter-pole, type S motor. As the operating conditions vary greatly for different classes of work the ratings of the adjustable speed motors are given for both continuous and intermittent service. The constant speed motor ratings are given for continuous service only. In each table both the open and enclosed ratings are given. In still another table the dimension and weight of each part is given for both adjustable and constant speed types.

THE PITTSBURGH TRANSFORMER COMPANY, Pittsburgh, Pa., has issued bulletins 1100 and 1102, descriptive of its bell ringing transformers and fuse blocks. While the bell ringing transformer is made primarily for the purpose of bell service, it may be used for a number of other purposes. A diagram contained in the bulletin shows the transformer wired to electric bells, a toy motor and miniature lamps of various low voltages. The Pittsburgh transformer fuse block described in bulletin 1100 gives an illustration of these heavy, all porcelain blocks, and a table of proper size for various Pittsburgh transformers. Plate 1034 sent out by the same company shows the tank construction of Pittsburgh transformers.

THE ELECTRIC MACHINERY COMPANY, Minneapolis, Minn., C. H. Chalmers, vice-president, finds that the year 1909 was the best in the history of the company. This well-known manufacturer of electrical machinery has been in business since 1891, and its sphere of usefulness has increased each year. In addition to having live agents in the prominent cities of the United States the company now has agencies in the Philippines, Australia, Japan and Canada. The company's eastern business has been steadily growing, and a number of machines are now almost ready to ship to the Atlantic coast.

DATES AHEAD.

Minnesota Electric Association. Annual convention, Minneapolis, Minn., March 29, 30 and 31.

Missouri Electric, Gas, Steel Railway and Water Works Association. Next convention, Jefferson City, Mo., April 14, 15 and 16.

Florida Electric Light and Power Association. Next meeting, Tampa, Fla., April 21.

Iowa Electrical Association and Iowa Street and Interurban Railway Association. Annual conventions, Sioux City, Ia., April 20 and 21.

National Electric Light Association. Annual convention, St. Louis, Mo., May 23-28.

Michigan Electric Association. Annual convention, Port Huron, Mich., August 16, 17, 18.

RECORD OF ELECTRICAL PATENTS.

Issued (United States Patent Office) March 8, 1910.

951,116. TIME-ALARM. John W. Haywood, New York, N. Y. Filed August 11, 1909. A contact arm, operated by clockwork, works over contacts arranged on a segment.

951,129. CABLE-TERMINAL. Frank G. Jones, Muskegon, Mich. Filed March 11, 1908. A two-part base block is surmounted by a series of superposed sections of insulating material, each section comprising separable halves and having binding post terminals mounted through its walls.

951,147. IDENTIFIABLE CABLE CONDUCTOR. Albert B. Porter, Chicago, Ill., assignor of one-half to McMeen & Miller, Chicago, Ill., a Copartnership; Theresa Porter, administratrix of Albert B. Porter, deceased. Filed June 16, 1906. Each conductor is covered with a spiral wrapping of insulating material marked at intervals with an identifying number or the like.

951,148. ELECTRIC CALL-CLOCK. Owen P. Ragan, Ridgeway, Mo. Filed April 15, 1909. Describes the machanism of an electric time clock.

951,159. ELECTRIC LIGHTER. William Voltz, Chicago, Ill. Filed July 22, 1909. There is a lighting tip at one end of the device and a handle at the other containing an electromagnet coil. Contact is broken by the action of an armature, transmitted by a nonmagnetic rod to the tip.

951,190. TELEGRAPH-ARM. Maurice Lachman, New York, N. Y., assignor to the universal Electric Welding Company, New York, N. Y. Filed Jan. 26, 1909. Pins are electrically welded to the internal face of one flange of a channel iron and project through holes in the other flange.

951,192. BATTERY-WELL. Charles F. Massey, Chicago, Ill. Filed Feb. 6, 1909. Above the battery chamber is a thickened lug formed in the wall of the well, having therein a conduit passage terminating in a conduit passage adapted to receive the end of a trunking box.

951,224. TIME-STAMP. Clarance C. Sibley, Perth Amboy, N. J. Filed Jan. 9, 1906. The arm that carries the pad is locked by a magnet armature.

951,228. METHOD OF DECOMPOSING SALTS. Jasper Whiting,

Boston, Mass., assignor to The Whiting Company, Boston, Mass. Filed Dec. 16, 1908. The method consists in passing an electric current through an electrolyte to a quiescent body of liquid metal as cathode, transferring the body by gravity to a region of oxidation, and returning the denuded metal to the region of electroyltic decomposition.

951,229. ELECTROLYTIC CELL. Jasper Whiting, Boston, assignor to The Whiting Company, Boston, Mass. Filed Dec. 16, 1908. A decomposing cell has a liquid metal cathode, an outlet for the cathode, controlling means for the outlet, and means operating at predetermined intervals for actuating the controlling means.

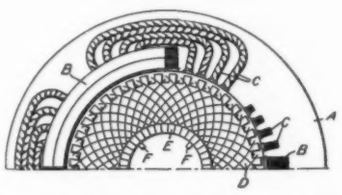
951,259. ELECTRICAL-CIRCUIT PROTECTOR. Charles A. Rolfe, Adrian, Mich., assignor to Rolfe Electric Co., Rochester, N. Y. Filed Dec. 1, 1902. An escapement wheel moves one tooth when the piece of solder that holds it against the action of its spring is softened by the current.

951,265. MEANS FOR ELECTROPLATING PIPE, ETC. Lynn A. Williams, Evanston, Ill., assignor to Daniel Hayes Murphy, New Castle, Pa. Filed June 19, 1908. Provision is made for rotating and longitudinally moving the rods or pipes in the tank.

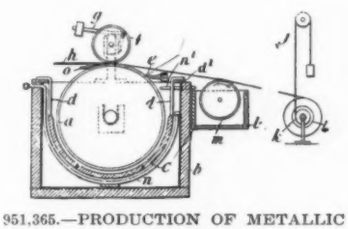
951,287. ELECTRIC TOASTER. Leon F. Parkhurst, Pittsfield, Mass., assignor to General Electric Company. Filed Nov. 20, 1908. Comprises an openwork wire cage having baskets at the sides to receive material to be toasted or broiled, a high-resistance refractory heating wire mounted between the baskets, terminals and leads in the base, and a plurality of insulating plugs at the top to support the wire.

951,298. SUSPENSION-CLAMP. Arthur O. Austin, Barberton, Ohio, assignor to The Akron Hi-Potential Porcelain Company, Barberton, Ohio. Filed Dec. 9, 1909. The upper part of the clamp is adapted to be attached to a coupling member, and the lower part is provided with a groove in which a wire or cable can be gripped by means of depending threaded studs.

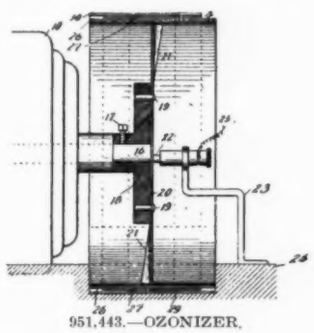
951,305. MULTIPLE-FUSE BLOCK. Charles H. Dunfee, Denver, Colo., assignor to The Dunfee Electric Company. Filed June 12,1908. Two cylindrical fuse blocks are arranged in suitable proximity and adapted to rotate, each fuse block being equipped with a number of fuses; means are provided for synchronously rotating the two blocks, and means whereby correspondingly located fuses upon the two blocks are simultaneously thrown into the circuit.



951,357.—SINGLE-PHASE COMMUTATOR-MOTOR.



951,365.—PRODUCTION OF METALLIC PAPER.



951,443.—OZONIZER.

951,311. METHOD OF PURIFYING WATER ELECTROLYTICALLY. Harry B. Hartman, Pittsburg, Pa., assignor to McDowell Manufacturing Company, Pittsburg, Pa. Filed May 22, 1909. The method consists in causing the liquid to flow between metallic electrodes and there subjecting the same to the action of an electric current, making the circuit when starting the liquid flow, and breaking the circuit when stopping the liquid flow, but slightly later than the latter.

951,312. CONTROL VALVE MECHANISM FOR EYECTROLYTIC WATER-PURIFYING APPARATUS. Harry B. Hartman, Pittsburg, Pa., assignor to McDowell Manufacturing Company, Pittsburg, Pa. Filed May 22, 1909. Comprises a casing, a valve arranged to normally close the passage through the casing, a movable member operated by liquid flow, a circuit controller actuated by the movable member, and connections between the movable member and valve and arranged to open the valve afetr the circuit is closed at the circuit controller.

951,313. ELECTROLYTIC WATER-PURIFYING APPARATUS. Harry B. Hartman, Pittsburg, Pa., assignor to McDowell Manufacturing Company, Pittsburg, Pa. Filed May 22, 1909. Comprises an electrode box, a circuit maker and breaker, and a device controlled by the flow of liquid through the apparatus and arranged to actuate the circuit maker and breaker and to retard the breaking of the circuit until after the liquid ceases to flow.

951,314. ELECTRODE-BOX FOR LIQUID-PURIFYING APPARATUS. Harry B. Hartman, Pittsburg, Pa., assignor to McDowell Manufacturing Company, Pittsburg, Pa. Filed May 22, 1909. Comprises a box, a plurality of removable vertical electrode plates therein arranged to intercept the passage through the box and cause all the liquid to flow therebetween in zizzag course up and down, a removable cover sealing the box and holding the plates in position, a flushing outlet underneath the plates, and electrical connections to the plates.

951,315. CURRENT REVERSING AND CONTROL MECHANISM FOR LIQUID-PURIFYING APPARATUS. Harry B. Hartman, Pittsburg, Pa., assignor to McDowell Manufacturing Company, Pittsburg, Pa. Filed May 22, 1909. A motor actuated by the flow of liquid being purified actuates a reversing switch periodically during the flow of the liquid.

951,319. ADJUSTABLE TELEPHONE SUPPORT. Robert Krum and Henry Weingartner, Lawrence, Kans. Filed Nov. 2, 1909. A horizontal arm mounted for swinging about a vertical post has a tubular arm pivoted for vertical movement on the horizontal arm. An extension arm fitted slidingly in the tubular arm has at its free end a sleeve for the reception of the standard or post of the telephone.

951,347. ELECTRIC SNAP-SWITCH. George E. Stevens, Lynn, Mass., assignor to General Electric Company. Filed Oct. 7, 1909. In combination with a stationary spindle, are contacts at one end thereof, a garter spring encircling the spindle and adapted to connect the contacts, and means for moving the spring along the spindle.

951,354. STRAIN-INSULATOR. Montraville M. Wood, Chicago, Ill., assignor to General Electric Company. Filed Sept 15, 1905. An insulating turnbuckle has a body of insulation, a metallic cup thereon having an internal groove, a plate inserted in the cup, a retaining ring sprung into the groove, and an eyebolt swiveled in the plate.

951,357. SINGLE-PHASE COMMUTATOR-MOTOR. Ernst F. W. Alexanderson, Schenectady, N. Y., assignor to General Electric Company. Filed Jan. 7, 1908. Comprises a stator, an exciting winding thereon, an inducing winding unevenly distributed in slots on the faces of the poles of the exciting winding, the greater part of its effective ampere turns being near the pole-tips, an armature having the coils of its winding of a pitch approximately equal to the circumferential width of the pole faces of the exciting winding, a commutator and brushes for the armature, and connections for including the armature in a local closed circuit.

951,365. PRODUCTION OF METALLIC PAPER OR THE LIKE. Sherard O. Cowper-Coles, Westminster, London, England. Filed Feb. 28, 1908. The process of continuously forming metal-covered paper, consists in depositing metal upon a rotating drum (partially immersed in an electrolyte), causing the electrolyte to impinge against the periphery of the drum during the deposition of the metal, then uniting the film deposited on the periphery of the drum to a continuous sheet of paper and removing the paper and deposited film of metal from the drum.

951,385. PROCESS OF PRODUCING ALLOYED STEEL. Frank L. Antisell, New York, N. Y. Filed Apr. 3, 1907. The process consists in forming primary steel, introducing the steel into an electric furnace containing an alloying element, and combining in the electric furnace the steel and alloying element to form an alloyed steel.

951,400. SUPPORT FOR INCANDESCENT-LAMP FILAMENTS Arthur S. Knight, Newark, N. J., assignor to Westinghouse Lamp Company. Filed July 19, 1909. The end portion of a looped terminal crosses and extends beyond an intermediate portion.

951,411. LIGHTNING-PROTECTOR FOR BUILDINGS. John P. A. Anderson, Madrid, Iowa. Filed Mar. 12, 1906. A lightning rod is supported in straps which are riveted to, and overlap at their adjacent ends, the parts of a metallic roof comb formed in sections in overlapping positions.

951,443. OZONIZER. Oscar Linder, Chicago, Ill., assignor to Standard Electro-Utilities Company. Filed Jan. 14, 1910. There are, in combination: a source of high-voltage electric current; a rotary fan operating to maintain a continuous flow of air and having its vanes adapted to constitute one of the electrodes for the electrical discharge that ozonizes the air; a cylindric an-

nulus of dielectric concentric with, and slightly spaced from, the fan; and an electrode on the outer side of the dielectric and opposed to the peripheral path of the vanes of the fan-electrode.

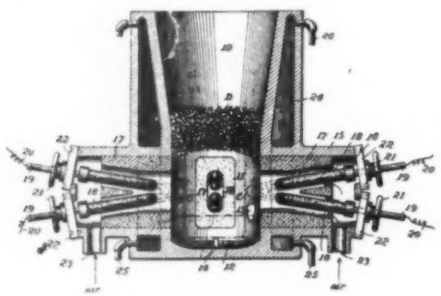
951,446. ELECTRIC CUT-OUT. Thomas E. Murray, New York, N. Y. Filed Mar. 27, 1909. Comprises a box, two fuse cases and fuses seated in the box, a transverse partition, a switch block slidable on the partition, and circuit connections; the block being movable to open and close circuit to both of the fuses simultaneously.

951,445. SOCKET FOR INCANDESCENT ELECTRIC LAMPS. John J. Rooney, New York, N. Y. Filed Jan. 5, 1910. Comprises an insulating base, a mtallic sleeve placed in the base and having a rigid terminal projected through an opening in the base at one side thereof, an insulating block secured in and projecting from the end of the sleeve, a terminal strip projecting through an opening in the base at the other side thereof, and a contact screw passed through the insulating block into the last-named terminal strip.

951,458. ELECTRIC FURNACE AND METHOD FOR OPERATING SAME. Jabea F. Shawhan, Dayton, Ohio. Filed June 16, 1909. The electrodes, which are located outside of the furnace proper, are positioned so as to form an arc in the tuyere sleeve (located in the furnace wall), and means are provided for directing air over the radiating surfaces of the tuyere and for deflecting the arc.

951,505. INSULATING-TUBE. Thomas T. Mather, Egg Harbor City, N. J. Filed Oct. 14, 1909. The tube consists of two longitudinal halves doweled together, roughened on their inside surfaces, etc.

951,524. WIRELESS CONTROLLING DEVICE. Charles L. Coleman, San Leandro, Cal. Filed Jan. 25, 1909. A kind of make-and-break device co-operates with a coherer, etc.



951,458.—ELECTRIC FURNACE.

951,527. TELEPHONY. Ruben C. M. Hastings and Thurston Matheny, Athens, Ohio. Filed Oct. 28, 1908. The system comprices a selecting mechanism at each telephone, a magneto calling circuit normally held operative by the selecting mechanism and movable to render the magneto circuit inoperative at the first operation of the selecting mechanism and a receiver hook locking device operable to render the magneto circuit of connected subscribers operative after movement of the selecting mechanism.

951,546. RESONANT CAB SIGNALING SYSTEM. Harold D. Patterson, Mount Vernon, N. Y., assignor to Lauder & Patterson, Mount Vernon, N. Y., a co-partnership. Filed Sept 28, 1908. Describes an electrical system for operating a signal in the cab of an engine when another train is in the block or a track rail is broken.

951,558. TELEPHONE SYSTEM. Samuel H. Couch, Boston, Mass. Filed June 2, 1906. A telephone system comprises a plurality of stations, a ringing battery, a talking battery, a pair of bus wires extending from each battery to all of the stations, one selector conductor for each station independent of the bus wires also extending to all the stations, a local circuit at each station containing a telephone and a retardation coil, all of the circuits being normally open, and permanently connected in mutliple across the talking bus wires, and means for selecting any one of the selective conductors and connecting it in a circuit comprising either the talking or ringing battery.

951,598. LAMP-SHADE HOLDER. John Cruikshank, Shamokin, Pa., assignor of one-third to Joseph M. Dunkelberger, Mount Carmel, Pa. Filed May 17, 1909. The shade holder comprises a split ring adapted to engage an electric-light socket and presenting an outwardly-extending knob or boss, and a holder having a neck or collar adapted to encircle said ring and provided with a bayonet groove to receive said knob or boss.

951,601. CIRCUIT-CHANGER. Patrick J. Doyle, Chicago, Ill., assignor of one-half to Charles W. Jackson, Chicago, Ill. Filed Apr. 7, 1909. There are a driving gear wheel, and a driven gear wheel, the former adapted for connection to the source of electric supply, and the latter having its toothed rim formed into a series of insulated sections; individual terminals are connected to the insulated sctions, and spring tongues are attached to the insulated sections and adapted to afford final contact with the driving gear.

951,614. APPARATUS FOR CASTING DENTAL INLAYS. Charles L. Kemery, Pittsburg, Pa. Filed Mar. 27, 1908. Dsecribes a form of electric furnace.

951,622. TROLLEY-RETRIEVING DEVICE. George W. Snow, Holyoke, Mass. Filed Feb. 2, 1909. Extraordinary draft on the trolley rope tends to straighten a portion of the rope between two sheaves in the retriever, thereby releasing a detent and causing a spring to operate and pull in the cord.

951,623. RELAY. Alton E. Stevens, Fall River, Mass., assignor to International Electric Company, Fall River, Mass. Original application filed Jan. 9, 1907. Divided and this application filed Mar. 16, 1908. Describes a form of duplex relay.

951,631. ELECTRICAL TEST IMPLEMENT. Virgil H. Dake, Buffalo, N. Y. Filed Nov. 19, 1908. In combination with an inclosing case are independently movable points therein, each point having a cylindrical body portion and a tapered end, by which a plurality of slightly separated contact points will be obtained.

951,640. AUTOMATIC ELECTRIC RAILWAY-SIGNAL. Jacob Friedlander and Mirko Pecar, Gary, Ind. Filed June 1, 1909. Describes an electric signal system for a four-track crossing.

951,662. ELECTROPLATING-BARREL APPARATUS. Thomas A. Smith and Thomas Deakin, Walsall, England. Filed Sept. 25, 1909. A rotatable work-container is arranged with the tank containing the electrolytic solution.

951,695. TELEPHONIC APPARATUS. Pedro M. Oliver, Barcelona, Spain. Filed June 10, 1909. A telephonic receiving apparatus comprises an annular coil secured to the vibrator plate, and a magnet having one pole provided with a heel within the annular coil and adapted to contact with the vibratory plate, while the other pole terminates outside the annular coil.

951,732. TEMPERATURE-REGULATOR MOTOR. Charles E. Jewell, Auburn, N. Y. Filed June 21, 1905. Describes an electrically opearted thermostatic damper-regulating apparatus.

951,750. AUTOMATIC TIME-SWITCH. Paul J. Stuparich, San Francisco, Cal. Filed Mar. 16, 1909. Is driven by an electric motor.

951,765. ELECTRIC TOASTER. James I. Ayer, Cambridge, Mass., assignor to Simplex Electric Heating Company, Boston, Mass. Filed Oct. 26, 1909. The vertical heating element has a permanent inclosure for its top and opposite ends, etc., so as to prevent outside air currents from impinging on the material being toasted.

951,788. ELECTOR-ADJUSTABLE CONDENSER. Hugo Gernsback, New York, N. Y. Filed Jan. 9, 1909. Comprises a rectangular frame having indentations on the upper inner side thereof a conducting member carried by the upper inner side and fitting into this indentations, and means for supporting a plurality of condensers within the frame.

PATENTS THAT HAVE EXPIRED.

The following is a list of electrical patents (issued by the United States Patent Office) that expired March 14, 1910.

493,253. SIGNALING TELEGRAPH. Wm. E. Decrow, Boston, Mass.

493,313. DYNAMO ELECTRIC MACHINE. Elihu Thomson, Swampscott, Mass.

493,314. LIGHTNING ARRESTER. Elihu Thomson, Swampscott, Mass.

493,337. ARMATURE FOR DYNAMO ELECTRIC MACHINES. Horace F. Parshall, Lynn, Mass.

493,349. ARMATURE FOR MOTORS AND GENERATORS. Norman C. Bassett, Lynn, Mass.

493,358. ELECTRIC SEARCH LIGHT. Rudolph M. Hunter, Philadelphia, Pa.

493,359 and 493,360. ELECTRIC ARC LAMP. Rudolph M. Hunter, Philadelphia, Pa.

493,361. SWITCH FOR ELECTRIC MOTORS. Moritz Immisch, London, England.

493,369. ELECTRIC SWITCH. Alfred Stromberg, Chicago, Ill.

493,375. BALANCED ARMATURE FOR DYNAMO ELECTRIC MACHINES OR ELECTRIC MOTORS AND METHOD OF BALANCING SAME. Gano S. Dunn, New York, N. Y.

493,411. BASE FOR ELECTRIC LIGHT BRACKETS. Jas. T. Robb, Mount Vernon, N. Y.

493,425. ELECTRIC LOCOMOTIVE. Thomas A. Edison, Llewellyn Park, N. J.

493,439. COMMUTATOR FOR DYNAMO ELECTRIC MACHINES AND METHOD OF CONSTRUCTING SAME. Alexander W. Meston, St. Louis, Mo.

493,447. ARMATURE CONNECTION FOR DYNAMO ELECTRIC MACHINES. Geo. A. Rollins, Chicago, Ill.

493,485. ELECTRIC SWITCH. Andrew M. Coyle, Baltimore, Md.

493,618. ELECTRIC RAILWAY CONDUIT AND CONTACT. Joel Davis and Reuben M. Huntington, Denver, Colo.

493,620. TELEGRAPH RELAY. Samuel P. Freir, East Orange, N. J.